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POWER OF ATTORNEY: b6 Now, I have another question, and it's kind of important about when [redacted] mentioned to you that it said Agent Orange on it. Was that when you were stationed there, or at some later date when you were working your claim?

VETERAN: Oh, no. This was during...when the jobsite. When he brought the first load down, we were standing the in the truck. There were several trucks sitting there waiting to be unloaded.

POWER OF ATTORNEY: So, your recollection is that he mentioned it to you...(inaudible)?

VETERAN: Yeah, we were standing on the jobsite talking, and he says, "You know what we're unloading here?" 'Cause they didn't tell us until the day we started the dump, and I says, "What?" And he says, "This is Agent Orange, man." I said, "You kidding me?" He said, "No, just come here and look," and he showed me...you know...and there was writing on it that said...you know...didn't say "Agent Orange," it said: *Orange Compound,* or *Compound Orange.* And then he says, "Look," and he said, "Some of this stuff is from Nam." I said, "What are you talking about?" It said: *Republic of Vietnam,* on some of the drums, not all of them, but I remember his pointing that out to me.

POWER OF ATTORNEY: Okay.

DECISION REVIEW OFFICER: In his statement he...he said that the...the hole or the landfill stayed open for about six months and was used as a dump by other units. Is that...was that your understanding?

VETERAN: Yes, and that's why I explained the stuff was coming from other units in-country.

DECISION REVIEW OFFICER: So, you didn't handle everything that went in there?

VETERAN: Oh, yes. I'm the one that buried it.

DECISION REVIEW OFFICER: Okay.

VETERAN: I'm just saying it came from other units....

DECISION REVIEW OFFICER: All right, so....

VETERAN: ...or other locations.

DECISION REVIEW OFFICER: ...this...this...this waste site...this toxic waste site was open for six months, and then it...it was no longer used?

VETERAN: From that spring until the following spring, it was open, yes.

DECISION REVIEW OFFICER: Okay.

b6

Now, you...I think there was something confusing...confusing in [redacted] statement. He refers to the spring:

Excavated a large ditch not used as a disposal sight until after March of '79.

Is he a year off in this statement?

VETERAN: Yes, and Captain [redacted]even stated...and when you got his letter in the file...he said due to his...you know...security clearance and all that...(inaudible)...but if you guys wanted to call him, you could call him anytime and he'd go more into detail of what went into that ditch, and he gave you his cell number....

DECISION REVIEW OFFICER: Okay.

VETERAN: ...his home number, and his office number at his place of business...his employment.

POWER OF ATTORNEY: And I have called him and he is still available. He's in a...he's city official in Texas.

VETERAN: He was kind of vague in the letter, and that was for his own reason, but he informed me if you guys wanted to talk to him he had no problem talking to the right people.

DECISION REVIEW OFFICER: Okay.

All right, I think...think you...you've given us a pretty clear picture of those events, so why don't we go on to the...I guess the other part of the claim.

POWER OF ATTORNEY: Okay.

Steve, you have been diagnosed with [redacted]?

VETERAN: Yes.

POWER OF ATTORNEY: And you're being treated for it?

VETERAN: Yes.

POWER OF ATTORNEY: By whom?

b6

VETERAN: Dr. [redacted]

POWER OF ATTORNEY: Okay, and we have....

DECISION REVIEW OFFICER: Sorry. So, that's a 45-minute tape. I better stop it here and see if it stopped. Okay. Okay, let's see what it says. Okay, stop, play, here we go.

All right. Let's continue.

POWER OF ATTORNEY: Now, you said you were being treated by Dr. [redacted]s that at the San...(inaudible)...Counseling Center?

VETERAN: Yes.

POWER OF ATTORNEY: In what town?

VETERAN: It's in Apache Junction.

POWER OF ATTORNEY: And the last exhibit to our memorandum is the most recent letter dated June 30th, from...dated this year, confirming what the...both the diagnosis and the treatment. When did you first start experiencing symptoms of that...that you now know to be [redacted]?

VETERAN: Probably since I got out of the service. I just had a lot of problems to deal with.

POWER OF ATTORNEY: And what event took place in the service that....

VETERAN: Well, there's several. I was in a bad truck accident. I got over that, but this...this whole job thing over the years, the rejection...you know...over the years. I've tried contacting the VA on several occasions and it's the...it's always the same thing that....

POWER OF ATTORNEY: Well, you don't get...unfortunately I don't think the VA acknowledges that you get [redacted] from...from long claim processes, but you did mention a severe truck accident, so let's explore that.

VETERAN: Oh, this one I know the date to. It was July the 5th, the day after...1976...the day after bicentennial, and....

POWER OF ATTORNEY: Where were you?

VETERAN: ...we were at a...we were on a job, a TDY job up in Yosemite National Forest at a...a Boy Scout Camp, and when....

POWER OF ATTORNEY: This was...you were in the military?

VETERAN: I was stationed at Presidio, San Francisco.

POWER OF ATTORNEY: That's a nice spot.

VETERAN: Yeah, it was...(inaudible)...there. It was nice.

POWER OF ATTORNEY: Okay, and what happened at Yosemite?

VETERAN: We were coming off...we'd finished the job and what we did...we built three retaining ponds down a ridge for helping fight forest fires and stuff, and I was there cutting fire breaks and cleaning up the fire breaks with my dozer for pretty much that summer, and we were on our way back.

POWER OF ATTORNEY: You mentioned an accident?

VETERAN: Yeah, we were in a convoy with a dozer. I think there was three trucks...semis.

POWER OF ATTORNEY: What were you driving?

VETERAN: I was riding shotgun in the truck that was hauling my bulldozer. It was part of the deal if the driver you will assist or accompanied the driver, it was your responsibility to secure the load and ride shotgun with the driver with your equipment.

POWER OF ATTORNEY: And where were you when the accident happened?

VETERAN: We were coming down the mountain and our brakes failed. We took a hell of a ride down the mountain with no brakes.

POWER OF ATTORNEY: Is this July of 1976?

VETERAN: Yes, the fifth of July, the day after bicentennial.

POWER OF ATTORNEY: And what...can you describe the accident?

VETERAN: Yeah, the...we made it through a couple of hairpin turns on two wheels, and we hit the straightaway, and driver...his name was b[redacted]he was pretty thin, didn't have good experience driving. I probably wouldn't have sat here, but anyways, we tried to get the truck to slide the trailer...you know...by climbing the...(inaudible)...it was a divided highway and the dirt was too soft and the wheels dug in and we rolled the whole shoot and match, dozer, truck, trailer, and all, and I got banged up pretty good.

POWER OF ATTORNEY: Were you hospitalized?

VETERAN: I was taken to the hospital for observation overnight.

POWER OF ATTORNEY: Were you injured?

VETERAN: Dislocated shoulder, I believe, and some cracked ribs other than that.

POWER OF ATTORNEY: Did you...since that time, have you experienced dreams or recollections?

VETERAN: Yeah.

POWER OF ATTORNEY: Intrusive recollections?

VETERAN: I still...once in a while I still have nightmares. At first I had a lot of nightmares about it and then whenever I'm here or driving and I start down a steep grade or something, if I smell brake linings, I'll flash back to it or I'll start...my heart will start racing when I smell brakes burning instead, because that's all we could smell. The truck wheels actually caught fire on the way down.

POWER OF ATTORNEY: Do you recall anything about...after...when the accident was over when you were laying there in the truck? Who investigated the accident?

VETERAN: The Army sent their own people up and investigated it and made sure that it wasn't the driver's....

POWER OF ATTORNEY: Any civilian police there?

VETERAN: There was a civilian, and in fact, we had a police officer escorting us down with the rollers going clear into traffic ahead 'cause we were for...basically just wide open.

L6

POWER OF ATTORNEY: What happened to [redacted]

VETERAN: He got banged pretty good. I got the worst of it 'cause the truck rolled to the passenger's side and I got....

POWER OF ATTORNEY: Do you know what hospital you were taken to?

VETERAN: Well actually, I kept telling them I wasn't hurt. They wanted to take me to the hospital there...a local hospital in the area, and I waited 'til I got back. They drove me back down to Presidio, and I went to the...I think it's Letterman Hospital there at Presidio, and that's where I went. They...I'm sorry, I should've turned that off...they gave me a good going over and I had slightly dislocated my shoulder, and the lady said I had...the doctor thought I may have a couple of cracked ribs. Basically, I was just...I was done.

POWER OF ATTORNEY: Were you questioned by any civilians off-base?

VETERAN: The police on the scene questioned us, and then like I said....

POWER OF ATTORNEY: Do you know what community that would've been the closest too?

VETERAN: If I remember, the closest town at the time was Strawberry, California.

POWER OF ATTORNEY: You know what county it was?

VETERAN: I couldn't tell you. I have a letter of a commendation somewhere in my paperwork of...from the Boy Scouts about the nice job we did up at the...that could get you the name of the town in the letterhead.

POWER OF ATTORNEY: Is there anything you want to add now?

VETERAN: Well, no. As far as the...any other...you know...just have a lot of nightmares at this job here, and what I was exposed to, I still don't...a lot...I don't know what I was exposed to.

POWER OF ATTORNEY: Has Dr. [redacted] old you that there's any connection between your accident or your experiences in Korea and your current [redacted]?

VETERAN: Well, I...he says I...you know...because of the...I have a lot of guilt. You know, I worry about the guys that's still over there right now drinking their coffee, and then I saw the people at the back gates...that village 'cause all that water and runoff feeds all the rice patties at the back gates. You know, I have a lot of issues about that, but I didn't make...(inaudible).

POWER OF ATTORNEY: Has Dr. [redacted] told you your [redacted] is related to those things?

VETERAN: A lot of it has to be...(inaudible)...on the stress and the guilt complex, I guess.

POWER OF ATTORNEY: I don't have any other questions.

DECISION REVIEW OFFICER: Great. I do see in your service treatment records you were in the auto accident in July of '76, and then about a year later you were complaining of neck pain, and then...and they made reference to that accident, and it said you were thrown into the windshield. Is that more or less accurate?

VETERAN: Yeah, I...I hit the windshield and the split shifter hit me in the chest. I lost consciousness for a little while, and I still do have neck problems; I got the spurs and my neck cracks and crunches all the time.

DECISION REVIEW OFFICER: Now, I saw the letter from Dr. [redacted]. He...he diagnosed [redacted], and then we set you up for an examination and they were not...(inaudible)...from the diagnosis at that time, and you submitted new evidence from Dr. [redacted] and he refers to symptoms [redacted]. So, I was...my...my...my thought was maybe...maybe we should get you examined again if I order to...you know...'cause we really need a confirmed diagnosis, so...and you do have a...you do have a...(inaudible)...feasible stressor that there was a...a...you know...threat to your physical integrity, I think....

POWER OF ATTORNEY: Well, the last time....

DECISION REVIEW OFFICER: ...'cause apparently that's what Dr. [redacted] indicated.

POWER OF ATTORNEY: ...the last time we had this meeting, and it was the day before my shoulder reconstruction...in fact, I gave you a copy of my MRI, and since I've seen you, I've had my shoulder totally reconstructed, and my bicep came off...I had to have it reattached. I had knee surgery four weeks ago, and they had to reattach my kneecap, and I was just informed last week...you know...that my right Achilles tendon and all the muscles in my foot are deteriorated to the point where they don't think they're going to be able to repair it. They're talking about fusing my ankle...been out of work since October. I filed this five years ago....

DECISION REVIEW OFFICER: Yeah, but that...that's....

VETERAN: ...'cause my neuropathy and everything was getting bad then, and this is just an ongoing....

DECISION REVIEW OFFICER: ...you know...as far as...as far as the shoulder injury in service, I was wondering, this was never put in...apparently put at issue before, and I was wondering why.

VETERAN: Well, this isn't...I don't think this is from the injury in the Army. No, this....

DECISION REVIEW OFFICER: Oh, okay.

VETERAN: ...what I'm saying is my health has deteriorated, and it all ties to the diabetes and I have a compromised immune system....

DECISION REVIEW OFFICER: Right.

VETERAN: ...and over the years, all the different antibiotics for cellulitis and everything, it's just finally taken it's toll. I'm out of work now. I have no medical other than my wife's, and like I said, I filed this almost five years ago, 'cause I knew then the neuropathy...I was getting to the point where...I'm a mechanic, that's what I do for a living...I can't hold on to screwdrivers, I can't feel my fingers. I take the maximum [redacted], and I can't feel my feet no more. I wobble when I walk...you know...and....

DECISION REVIEW OFFICER: I think after standing thought, I...I would be frustrated if my claim was this old, but...you know...since it's old, it's...you know...the pressure's on us to do something. We....

POWER OF ATTORNEY: Well, I'm....

DECISION REVIEW OFFICER: ...we're not going to let it sit.

POWER OF ATTORNEY: ...I'm asking for a hand out, I'm asking for a hand up. I mean, I was a good soldier, I did my job, and I buried their garbage for them, and this is what I got for my troubles.

DECISION REVIEW OFFICER: Okay.

VETERAN: You know, and I'm...I'm just...what bothers me...30 years ago, somebody made the call that five American boys were expendable. That ain't right. I've been sick off-and-on for the last 30 years, I was having problems with my liver being large before I got out, it's in my records, and I was told I was eating too many pizzas and too many hamburgers by a frickin' doctor and he put me on a weight-loss program and kept weighing me in, and when I weighed out, my last weigh in was 219. That's what I weighed when I went in, so that's bull.

POWER OF ATTORNEY: Well, that's was a pretty good closing statement. I think we've got everything in that we....

DECISION REVIEW OFFICER: Yeah, I think our time is about up.

POWER OF ATTORNEY: Right.

DECISION REVIEW OFFICER: Thank you for coming in again.

VETERAN: Oh, that was one other thing you didn't clarify that was in your notes when I asked for the transcripts and I was told they were lost...you notes, there's some incorrections [sic] in that...in your notes...(inaudible).

DECISION REVIEW OFFICER: Yeah, I...I...I heard and put that together based on...on the notes I have and I...I...I admit that I got the name of your camp wrong.

POWER OF ATTORNEY: Yeah.

VETERAN: You want this?

DECISION REVIEW OFFICER: I know...I realize it's...it's not Camp Casey....

VETERAN: No, you...I think Camp Casey or Humphreys...it's Camp Carol.

DECISION REVIEW OFFICER: ...and I think you....

VETERAN: Do you want to keep this?

DECISION REVIEW OFFICER: ...I think you submitted it....

POWER OF ATTORNEY: But I think this is a better...better picture though.

DECISION REVIEW OFFICER: ...but I'll...I'd be glad 'cause I understand what you're trying to point out from that...(inaudible).

POWER OF ATTORNEY: You know what I'd really like to see happen is I'd like to see someone go dig that ditch, but I guess that's not going to happen in this case.

DECISION REVIEW OFFICER: Well...you know....

VETERAN: Or at least the right authorities be informed that they need to look into it 'cause it's still visible by satellite. Like I said, that's...that's my recurring nightmare...is what's going on over there right now and the people drinking the water over there. There's a creek...runs right through that and feeds into the main river.

DECISION REVIEW OFFICER: Okay, I understand your concern.

VETERAN: You know, and that's what I have nightmares about the kids with deformities and....

DECISION REVIEW OFFICER: Well, there...there was just one other question. I think in one of the statements we got one of your...one of the lay statements, he indicated that they...they were aware of those type of problems in Korea...the population around there. Do you have any idea where that...do you recall that or where that information came from?

VETERAN: Yeah, when I...when I first decided to file this 'cause I was told that I had no recourse 'cause I...every time that I called the VA over the first 10 years I was out of the service, as soon as I'd say I was in Korea they'd..."Oh, they didn't have the Agent Orange in Korea. Have a nice day," click.

DECISION REVIEW OFFICER: Right.

VETERAN: b6 Okay, and then when I read this article by Mr. [redacted] who filed all the paperwork under the Freedom of Information Act, it was an article in a VA magazine. I'm sitting in my doctor's office usually like I am, and that's...I contacted him. He said, "If you got any information or you have any knowledge of the presence of Agent Orange in Korea, call me," so I did, and then what happened, I was contacted. He goes over there on reunions, and he was telling me...(inaudible)...birth defects and stuff and then he put me in contact with a reporter...a Korean reporter, and I didn't want to get involved....

DECISION REVIEW OFFICER: Okay.

VETERAN: ...but they wanted me to come over there and show them where the stuff was buried and I just...I declined.

DECISION REVIEW OFFICER: What was his name again?

VETERAN: I want to say his name was Ree (ph)...something Ree. I got his...I have his phone number.

POWER OF ATTORNEY: It was a Korean reporter?

VETERAN: b6 b6 He was a Korean reported and he was like the [redacted] if [redacted] does all the military reporting. He contacted me on several occasions and wanted to fly me over there...(inaudible)...my plane ticket

DECISION REVIEW OFFICER: The name of the person that alerted to that situation?

VETERAN: b6 It was Mr. [redacted]

DECISION REVIEW OFFICER: [redacted] b6

POWER OF ATTORNEY: Spell it.

VETERAN: Yeah, you got a copy.

DECISION REVIEW OFFICER: Yeah, I think I recall seeing...(inaudible).

POWER OF ATTORNEY: [redacted] b6

DECISION REVIEW OFFICER: Okay.

VETERAN: I contacted him 'cause I just...he had like a...you know...any information...he could help me and point me in the right direction and get my claim filed, and that's when I started to pursue this, about six months after I read the article....

DECISION REVIEW OFFICER: Okay.

VETERAN: ...and I didn't ask him to do it, he did it on his own. Just one day he says, "There's this guy who's going to call you. I gave your name to this reporter, but I jus didn't have a good feeling and I didn't want to wind up as a poster child for Amnesty International or something.

DECISION REVIEW OFFICER: I should've brought this up earlier, but there was one question that had my mind about...you said you were at the Presidio, and you...you were...whoever you were with was shot at or there was an attack, I guess?

VETERAN: That was another...(inaudible)...and then we used to go up there, too. Yeah, it was New Years Eve of '76.

DECISION REVIEW OFFICER: Did that...did that make in the papers?

VETERAN: Yeah, it was in the newspapers.

DECISION REVIEW OFFICER: Okay, but it was well documented...(inaudible)...or whatever they were doing?

VETERAN: Yeah, I was on...what happened was I was on guard New Years Eve on the central magazine up on the backside of the base, and I was walking the perimeter and I could hear people talking, and whispering, and the fog had rolled in off Frisco Bay, and when I tried to make contact and challenged them...you know...I went though the whole...you know, "Halt! Who's there?" And everything. The next thing you know, I had bullets flying and tree bark flying all around me and I had crawled back to the guard shack and it turned out it was...they believe it was what was left of Patricia Hearst's...(inaudible)...the SLA.

DECISION REVIEW OFFICER: That was like December 31, '79?

VETERAN: No, this was in '76.

DECISION REVIEW OFFICER: Or that was before you went to Korea?

VETERAN: This was just before Korea. I spent my first...almost two years in Frisco, then I went to Korea, and then I came back to the States, spent my last nine months at Fort Ord.

DECISION REVIEW OFFICER: Okay. All right.

VETERAN: Yeah, that was a...that was quite the experience, too.

DECISION REVIEW OFFICER: Okay. All right, good. I think...I don't think I have any more questions for you. Is there anything else from either of you gentlemen? All right, we...we will go ahead and end this hearing. I...I neglected to indicate up front that we've just been talking with the Veteran, Mr. Stephen, (S-T-E-P-H-E-N), middle initial F, House, (H-O-U-S-E), File Number [redacted], and my name is [redacted] Decision Review Officer. We've been here for about 65 minutes and we'll...we'll end our hearing at this time.

I HEREBY CERTIFY THAT THE FOREGOING 36 PAGES ARE, TO THE BEST OF MY KNOWLEDGE AND BELIEF, A TRUE AND CORRECT HEARING TRANSCRIPT.

Transcribed by: [redacted] Date: August 4, 2010

HOUSE1495_JLM

STATEMENT OF STEPHEN F. HOUSE

The following statements were made by Stephen House on July 6, 2010, after reading the October 23, 2009, Report of General Information signed by [redacted] the DRO who held the DRO hearing on October 23. Mr. House was concerned about inaccurate impressions of his testimony in October 2009. After reading this statement, Mr House has signed it, below, and adopted it as a correct recitation of his recollections.

My name is Stephen F. House. The statements attributed to me, below, are a correct recitation of what I have said about my experience in Korea in 1978 - 79.

House's claim is not for September 1978. It's for the entire summer and fall of 1978, and for the Spring of 1979.

Vet's claim is not for Camp Casey. It's for Camp Carroll, Area D. This was generally the Chinook helicopter landing area. There was another landing area for Hueys.

He explained that he dug a ditch about a city block long - 300 yds plus or minus. The ground was almost pure sand, as opposed to dirt. He has pictures of the ditch. After the ditch was built he testified to being called from time to time to loads of barrels and equipment. After the ditch was built, his D-8 bulldozer and three yard bucket loader were left at the sight. He refers to this equipment as his because he had primary responsibility for its maintenance and control. . During the entire summer and fall the dozer and bucket loader at the ditch site were never washed.

After the dozer and bucket loader were left at the ditch, he would not go there every day, but he would be called on the average of once a week to bury barrels and equipment. The rest of the time he would be doing other jobs around Camp Carroll, or working on equipment at the Motor Pool. One the major jobs he worked on that summer was building an overpass over the creek that ran through the middle of the base.

The barrels were brought by truck drivers from other units, usually on five or ten ton tractor trailers. When they arrived, House or one of the other bucket loader operators were called. The trucks were escorted by House to the ditch. The bucket loaders could used like fork-lifts to unload the barrel pallets. They barrels were on skids, or pallets, and were occasionally covered with tarps. He was sometimes told by the drivers that some of the barrels were contaminated waste materials. Other times the drivers didn't know what they were delivering. He was responsible for removing the pallets from the trucks, moving them to the edge of the ditch, and then bull-dozing sand over them, covering one truckload of pallets at a time.

After the pallets were in the ditch, he would bulldoze sand on top of them. After enough sand was put on top of the barrels, the dozer would actually be on top of the barrels as it was pushing more sand in over them. At such times, Mr. House could occasionally hear, and feel, barrels bursting underneath his dozer from the weight of the sand and the dozer. He could see the sand become wet from the materials seeping up from below. The sand,

which was otherwise dry, became wet and stuck to the dozer tracks. There was a chemical smell at these times. The moist, sandy material would get on the operator. Mr. House got stains on his fatigues on these occasions.

Earlier in the summer most of the barrels buried in the ditch came from Camp Carroll. These barrels were in good condition, were OD color, and had Agent Orange written on them (See statement of [redacted] for more specific details). House remembers that [redacted] pointed out that some barrels had the words Vietnam on them. As the summer wore on, loads began appearing on trucks coming from other locations. The drivers were strangers to the Camp Carroll soldiers. The barrels they brought were frequently rusted and leaking when they were delivered to be buried. Some would be leaking as they were put in place at the edge of the ditch. These barrels appeared to have been left out in the elements because they were in bad shape. Some had Agent Orange written on them. Some had Agent Purple on them. Some were covered by green OD rubberized canvas tarps and could not be read.

On one occasion, a barrel split as it was being moved to the edge of the ditch. On that occasion Mr. House was soaked from the waist down with the contents of the barrel. His Sergeant, Sgt [redacted] (See buddy letter) sent House back to the barracks to shower up and change his fatigues. They were permanently stained. House will testify that Agent Orange was written on that barrel.

There was one instance, late in the Fall, in which a flatbed tractor trailer (Low Boy) was brought to the ditch at night under blackout conditions. There was frost on the ground. When Mr. House went to work that morning, he was directed to sign out a jeep, and go to the ditch. The flatbed was already there. The drums were bright yellow, and pristine, and the pallets were in good shape. They were partially covered by tarps, but their bottom quarter was visible. They were accompanied by a lieutenant. House noticed that the drums were different. The lieutenant said they'd been driving all night. House asked what they were burying. The lieutenant replied it was on a need to know basis. He said they weren't messing with moving pallets to the edge of the ditch because "it was too unstable."

The lieutenant directed House to get into the tractor trailer and back it into the ditch. When that was done, he told House to disconnect the trailer and drive the tractor out. When that was done, House was ordered to bury the trailer, barrels and all. The lieutenant's two NCO's returned from breakfast and the three of them left. That was the last burying job House did in 1978. He and a couple other brought the dozer and loader back down to the motor pool.

House had been asked by Capt. [redacted] train Korean soldiers ("KATUSA's) to operate the dozers and the loaders and he was doing that. See [redacted] Letter of Appreciation dated February 1979. In the winter of 78 - 79, the burying stopped, but when House visited the site the following Spring - around March, he notice that miscellaneous pallets had been dumped into the ditch. He noticed that the last quarter of the ditch had not been filled in. The ditch had filled with snow water. The water had a yellow/brownish foam on it. House noticed that all the vegetation down the ridge line from the ditch was dead or dying. There

were also dead pheasants and rabbits, and other birds and animals were around.

House went to see [redacted] b6 ccessor (can't remember name) at his office on Camp Carroll. House told him that the site was a mess and they had a big problems. He said they never finished capping off the ditch. The next day the Captain told House to get his dozer and took it up to the ditch. He bladed the ditch full of sand and smooth off the area. That was the last that he worked in that area. He shipped out shortly after that.

I have read the above and adopt it as my sworn statement.

7-6-10
Date

Stephen F. House
Stephen F. House

Signed and Sworn to before me this 6th day of July, 2010.

b6
[redacted]
Notary Public

OFFICIAL SEAL
[redacted]
NOTARY PUBLIC - STATE OF ARIZONA
MARICOPA COUNTY
My Comm. Expires June 20, 2013

Camp Carroll Site Questions/Interview w/Mr. Steven House

23 May 2011

Present at the interview:

Army Reps:

-COL Donald Degidio, IMCOM Korea

-Mr. [redacted] b6 USAEC

-Ms. [redacted] b6 IMCOM Public Affairs – Environmental Branch

Veteran Reps:

Mr. Steven House

Mr. Theodore Jarvi, Mr. House's attorney

Answers:

1. When did you arrive at Camp Carroll, when did you leave?
    a. February 1978 thru February 1979
2. What was your unit, rank, duty position?
    a. D Company, 802nd Platoon
    b. Spec 4
    c. MOS 62L-20 (Heavy Equipment Operator)
3. Do you remember your chain of command? (Platoon ldr, company commander....up to highest rank)
    a. Squad Leader – [redacted] b6
    b. Platoon leader - 2LT [redacted] b6
    c. CPT [redacted] b6 Company Commander
    d. Top Sgt [redacted] b6
    e. Doesn't recall any higher ranked officers
4. Please describe what was disposed of at Camp Carroll? and when?
    a. Disposal took place between Spring 1978 (April/May) and Fall 1978

b. Material was in 55 gallon drums and delivered by truck

5. Please describe what it looked like, where it was located, what the area looked like.

   a. Drums – color OD Green

      - Lots of writing on drums in bright yellow or orange
      - Bright yellow or orange bands on the drums
      - Some said 'for province of Viet Nam'

   b. 4 drums to a skid

   c. Air Force delivered additional drums to the area

      - OD Green 55 gallon drums (looked brand new)
      - Same type of markings as described in 'b' above

6. Can you point out where it was disposed? Did it have a special name? Are you aware of the reason why it was disposed?

   a. See maps

7. How long did the transportation and disposal take?

   a. Ditch was surveyed – someone brought in to area to survey

   b. Ditch was dug w/ramps on either end

      - About 1-1/2 semi-trailers wide
      - Approximately ¼ city block long (including ramps)
      - About 30 feet deep
      - Original intent was to back dump trucks into the trench and dump the loads
      - Sides were unstable so drums were dumped into the ditch from the berm
      - Water was present at approximately 3-4' in depth at bottom of ditch

8. How much was disposed? In same location?

   a. Approximately 200-250 drums over initial 10 day disposal period

   b. Ditch was filled with drums and capped as the disposal progressed occurred

   c. Initial disposal occurred over approximately 10 days at a rate of 2-3 loads a day

d. Ditch remained open for approximately 6 months with occasional disposal

9. Where did the containers originally come from?

   a. PFC [redacted] b6 ruck Driver and SGT [redacted] b6 Truck Driver drove the drums into the dump site. Mr. House does not know where they came from.

10. Where were they stored prior to disposal? Did it have a special name? Any other locations where they were stored?

    a. Mr. House did not know

11. What was the condition in storage?

    a. Mr. House did not know

12. How were they moved?

    a. Flatbed truck

13. Who was involved with the transportation and disposal?

    a. Truck Drivers: [redacted] b6 d [redacted] b6

    b. Heavy equipment operators: Stephen House and [redacted] b6

       - Mr. [redacted] b6 ecame ill and was medivac'd out of the area
       - Mr. House continued disposing of the barrels

14. Describe the containers (all the same, any markings)?

    a. What where they made of?

       - Steel 55 gallon drums

    b. If leaking, what did the substance(s) look like/ smell like?

       - Smelled similar to creosote and/or ether – strong chemical smell

    c. If leaking, what percentage of the containers do you think were leaking? Where was it leaking? How much was leaking from the containers?

       - Doesn't recall

    d. If leaking, what did you do with the material that leaked both during transportation and disposal?

       - Doesn't recall

15. Describe how you disposed of the containers?

    a. Length of trench, width, and depth of burial.

        - ¾ city block long
        - 1-1/2 semi trailers wide
        - ~30 feet

    b. Were they still leaking?

        - Yes and some were crushed in the disposal process

    c. How where the containers arranged in the trench?

        - Dumped into the trench – no specific arrangement

    d. What type of soil was excavated? What did you do with the excavated soil?

        - After breaking through initial cap of hard soil, soil consisted of pea gravel and sand
        - Excavated soil was for berm and used to back fill trench after drums were dumped

    e. How did you cover?

        - See above

    f. Were you there long enough to notice if any vegetation grew back?

        - No

16. Are you aware if the containers were removed after they were buried?

    a. No

17. Other topics covered

    a. Mr. House stated he received some chemical burns on his legs from kick-up of dirt while compacting back-fill of ditch

    b. Mr. House stated he discovered ditch had not been completely back-filled in Fall 1978. He noticed thick yellow foam leaching from open end of ditch into soil and crossing road. He also noticed dead birds and grass in the affected areas. He reported through his chain of command as was directed to close the ditch. Closing ditch took approximately ½ day.

c. Mr. House also reported suspect area between helipads (see map). The soil looked discolored. Fumes coming from the soil caused burning in throat. He reported having several chest X-rays as a result of this exposure.

d. Mr. House reported that in addition to the barrels, a trailer with bright yellow barrels with a tarp on it along with two old fuel pod trailers were buried at the site.

Camp Carroll Site Questions/March Interview Answers

26 May 2011 23

Present at the interview:

Army Reps:

-COL [redacted]onald Degidio, IMCOM Korea

-Mr. [redacted] USAEC

-Ms. [redacted] IMCOM Public Affairs – Environmental Branch

Veteran Reps:

Mr. [redacted]

Mr. [redacted] brother, also retired Army)

1. When did you arrive at Camp Carroll, when did you leave?
    a. January 1978 to January 1979. Stayed entire year, did not take leave.
2. What was your unit, rank, duty position?
    a. 802nd Engineering Battalion, D Company, E4, 62 Lima (equipment operator).
3. Do you remember your chain of command? (Platoon ldr, company commander....up to highest rank)
    a. Squad Ldr - Sgt. [redacted] toon Ldr - LT [redacted] ompany Commander – CPT [redacted]
4. Please describe what was disposed of at Camp Carroll? And when?
    a. Mr. [redacted] s asked by Sgt. [redacted] place some spent, rusted, concertina wire in trench. Mr. [redacted] was not present during any other burial activities; however, Sgt. [redacted] ndicated that the trench was built to dispose of used motor oil. Scuttlebutt on post was that Agent Orange was buried there.
5. Please describe what it looked like, where it was located, what the area looked like.
    a. Mr. [redacted] as one of several equipment operators who excavated the trench.
    b. Length was ¾ to 1 city block or roughly 100-yards. Width of 290 scrapper. Depth 10-12 feet.

c. Area were trench was constructed, sloped downward towards the east.

6. Can you point out where it was disposed? Did it have a special name? Are you aware of the reason why it was disposed?

   a. After reviewing Mr. House's photographs and the maps provided by COL Degidio, Mr. [redacted] b6 ndicated he thought the trench was located west of the helipads, in the general area indentified by Mr. House. See attached maps which depict the area identified by Mr. March.

   b. Mr. [redacted] b6 learly remembers 2 water pits (1 small, 1 large) for tank water proof tests. The distance from the trench to the water pits was roughly 150 yds. See attached maps which depict the area identified by Mr. [redacted] b6

7. How long did the transportation and disposal take?

   a. Unaware.

   b. Mr. [redacted] b6 ated that during PT runs he would run by a storage area containing 55-gallon, OD Green drums. The storage area was located in the Depot area. The drums were stacked on their sides, pyramid style, 6-feet high. See attached maps which depict the drum storage area identified by Mr. [redacted] b6

8. How much was disposed? In same location?

   a. Unaware.

   b. However, when asked by Mr. [redacted] b6 how many drums sitting upright could be placed in the trench he built, Mr. [redacted] ndicated, no more than 2 high.

9. Where did the containers originally come from?

   a. Mr. [redacted] b6 ated that during PT runs he would run by a storage area containing 55-gallon, OD Green drums. The storage area was located in the Depot area. The drums stacked on their sides, pyramid style, 6-feet high. See attached maps which depict the drum storage area identified by Mr. [redacted] b6

   b. Mr. [redacted] b6 oticed during a PT run (subsequent to the building of the trench), that the drums were no longer present in the storage area. He also noticed that the trench was filled in.

10. Where were they stored prior to disposal? Did it have a special name? Any other locations where they were stored?

    a. See attached maps which depict the drum storage area identified by Mr. [redacted] b6

11. What was the condition in storage?

a. He didn't recall the condition of the drums.

b. While on post, he observed flatbed trucks loaded with drums. The flatbeds were lined with rubber sheets. Mr. [redacted] did not see the drums being placed in the trench.

12. How were they moved?

a. While on post, he observed flatbed trucks loaded with drums and flatbed was lined with rubber sheets.

13. Who was involved with the transportation and disposal?

a. Mr. Stephen House and Mr. [redacted] were the equipment operators and Mr. [redacted] and Mr. [redacted] were the truck drivers.

14. Describe the containers (all the same, any markings)?

- Couldn't tell if they had any colored bands, or couldn't read writing on drums. He described the drums located in the storage area and on the flatbed trucks as 55-gal, OD Green, steel drums.

b. What where they made of?

- 55-gallon, steel OD Green drums.

c. If leaking, what did the substance(s) look like/ smell like?

- No odors during trench excavation.

- Was at trench site after nearly covered, and did not recall any smells or anything unusual about the site.

d. If leaking, what percentage of the containers do you think were leaking? Where was it leaking? How much was leaking from the containers?

- Unaware.

e. If leaking, what did you do with the material that leaked both during transportation and disposal?

- Mr. [redacted] was not involved in the transportation and disposal of drums.

15. Describe how you disposed of the containers?

a. Length of trench, width, and depth of burial.

- Wasn't involved in any disposal of drums.
- Mr. [redacted] was ordered to build a trench.

- Length of trench built was ¾ to 1 city block or roughly 100-yards. Width of 290 scrapper. Depth 10-12 feet.

b. Were they still leaking?

- No knowledge.

c. How where the containers arranged in the trench?

- Doesn't have firsthand knowledge, however, he remembers hearing that the drums were stack 2-high and thinks they were set in the trench with a loader and not dumped.

d. What type of soil was excavated? What did you do with the excavated soil?

- Sandy soil.
- Excavated soil was placed on side of trench using scapper.

e. How did you cover?

- Unaware. Mr. [redacted] b6 as not involved with the covering of the trench.

f. Were you there long enough to notice if any vegetation grew back?

- No noticeable dead vegetation in the area. Lots of scrub grass. Also remembers that ringed-tailed pheasants were in the area.

16. Are you aware if the containers were removed after they were buried?

a. No.

17. Other notes from the interview:

a. Mr. [redacted] b6 noticed the trench had been nearly filled with exception to the north side of the trench.

b. Mr. [redacted] b6 s asked by Sgt. [redacted] b6 to place some spent, rusted, concertina wire in an open end of the trench (north end of trench). During the placement of the wire in the trench, Mr. [redacted] b6 observed 2 jeeps and a Crown Victoria sedan entering the gate. b6 MPs approached Mr. [redacted] sking "Are you aware of what's buried there". Mr. [redacted] said "yes" and the MPs left the site.

c. Mr. [redacted] b6 asked if the south gate (gate leading into helipads area) has moved since the 1970's. This gate and water pits were his reference for the location of the trench he excavated.

d. He was enrolled in class 7 of the NCO academy , 1978.

e. He doesn't recall any helipads being near the trench he built or any special names for the area.

f. Mr. [redacted] b6 erated the equipment to build the trench. It took no more than a week to build. It was completed in the Fall 1978. Doesn't recall wearing any special protective gear during construction of the trench.

g. Did not observe water in the bottom of the trench.

h. No discoloration of soil was observed or odors.

i. When asked, Mr. [redacted] b6 d recall a fence being nearby the trench.

j. Mr. [redacted] b6 eard that Mr. [redacted] b6 as on profile "wearing tennis shoes" because chemicals were spilled on his feet. He also had heard that Mr. House had chemicals spilled on his lower legs. He doesn't recall Mr. [redacted] b6 being evacuated from Camp Carroll.

Buddy STATEMENT

TO WHOM IT MAY CONCERN:

I [redacted] b6 SR. GIVE THIS TESTAMENT OF MY OWN FREE WILL.

I SERVED IN THE U.S. ARMY FROM AUG. 12, 1976 TO AUG. 11, 1980. DURING MY DUTY I WAS SENT TO KOREA IN AUGUST OF 1978. MY CAPACITY IN DELTA COMPANY, 802ND ENGINEER BATTALION WAS GENERAL HEAVY CONSTRUCTION MACHINE OPERATOR. I OPERATED AN EARTH AUGER, SCRAPER, DOZER, BACKHOE, AND DURING THE INCIDENT IN QUESTION, A BUCKET LOADER.

DURING MY DUTY I REMEMBER OPERATING A BUCKET LOADER PULLING UP TO THE BACK OF A TRUCK WHILE OTHER SOLDIERS LOADED THEM INTO MY BUCKET. I THEN DROVE TO AN ALREADY EXCAVATED SITE AND PUT THE BARRELS IN IT.

SOMETIME LATER I CAME DOWN WITH AN ILLNESS THAT AFFECTED MY BACK AND LOWER EXTREMITIES. THE CLINIC ON POST SENT ME TO THE MAIN HOSPITAL AT SEOUL WHERE THEY TREATED ME WITH EXPIERMENTAL DRUGS FOR AN ILLNESS THEY DIDN'T KNOW WHAT I HAD. AT FIRST I COULDN'T WALK BUT MY ILLNESS SUBSIDED SLIGHTLY AND I WAS ABLE TO WALK WITH CRUTCHES. THE HOSPITAL SENT ME BACK TO MY UNIT WHERE MY CAPACITY WAS LIKE A MEDICAL HOLDOUER. MY COMPANY PUT ME IN THE NBC ROOM WHERE I DIDN'T DO ANYTHING BUT WAS OUT OF THE WAY.

[redacted] PAGE 1 OF 2

buddy statement

1827 [redacted]

MY CONDITION DIDN'T GET MUCH BETTER SO THE CLINIC ON POST SENT ME BACK TO THE HOSPITAL AT SEOUL. THE HOSPITAL MEDIVACED TO WALTER REED HOSPITAL IN WASHINGTON D.C. AFTER SERVING ONLY 9 MONTHS IN SOUTH KOREA.

WALTER REED TREATED ME WITH WHAT THEY CALLED EXPIERMENTAL DRUGS BECAUSE THE DOCTORS SAID THEY REALLY DIDN'T KNOW WHAT WAS WRONG WITH ME.

AFTER SOME TIME I PROGRESSED FROM CRUTCHES TO A CANE AND THEN WAS ABLE TO GET AROUND WITHOUT AN AID. WALTER REED SAID THEY COULDN'T HELP ME ANY MORE SO I WAS SENT TO MY NEXT DUTY STATION FT BRAGG. I TRIED TO GET STATIONED AT FT. DEVENS, MASS., BUT WHEN FT. DEVENS CONTACTED WALTER REED, THE HOSPITAL HAD NO RECORDS OF ME BEING THERE.

AT FT. BRAGG N.C., I SERVED THE REST OF MY DUTY ALL THE TIME WITH A HEALTH PROFILE THAT SAID I DIDN'T HAVE TO DO ANY PHYSICAL ACTIVITY AND HAD TO WEAR TENNIS SHOES, NOT ARMY BOOTS, AS THE BOOTS CAUSED PHYSICAL PAIN ON MY FEET.

I ETS'ED FROM FT. BRAGG IN AUG OF 1980 AND TO THIS DAY CARRY MY MYSTERIOUS ILLNESS THAT I MAINLY FEEL IN MY BACK AND FEET. WHEN AT FT. BRAGG I WANTED MY MEDICAL RECORDS AND WAS TOLD THEY WERE "LOST."

66 10/5/07

[redacted]
DECATUR, IL. 62526

1828 CSS [redacted]

STATE OF ILLINOIS
COUNTY OF MACON

SIGNED BEFORE ME ON OCTOBER 6, 2007 BY STEPHEN F. HOUSE AND

[redacted] b6

b6 [redacted]

SEAL

OFFICIAL SEAL b6 [redacted]
NOTARY PUBLIC - STATE OF ILLINOIS
MY COMMISSION EXPIRES:05/10/08

Stephen F. House
STEPHEN F. HOUSE

[redacted] b6

b6 [redacted]

CSS

b6
[redacted]
Colonel, US Army (Retired)
[redacted] b6

March 3, 2008

Department of Veteran's Affairs

REFERENCE: Claim for Service Connection by Stephen House

The purpose of this letter is to provide evidence that may prove relevant to the claim for service connection of disabilities of Stephen House.

From August 8, 1978 to March 16, 1979, I served as Commander of D Company, 802nd Engineer Battalion. This unit was stationed at Camp Carroll in Waegan, South Korea. This Camp was an active Army depot facility and was near the much larger City of Taegu. The unit was an engineer construction company that had one horizontal equipment platoon and two vertical construction platoons. The "horizontal" platoon did earthwork with heavy construction equipment like D-8 bulldozers, scrapers, various size bucket loaders, back hoes, asphalt paving equipment, and concrete placement equipment. The "vertical" platoons had carpenters, electricians, and plumbers that were capable of constructing everything from concrete building foundations to the finished buildings that sat on the concrete foundations.

The unit was continuously tasked to perform both horizontal and vertical construction projects all over the southern portions of South Korea from Camp Carroll south to the coast in Pusan.

I recall in the spring of 1979 that we were tasked to excavate a large ditch on post in what was called Area D. This area was a ridgeline where helicopters landed. The company used both scrapers and bulldozers to excavate the large ditch. Stephen House, then Specialist House, was among those in the heavy equipment platoon that helped in this excavation. While I never personally visited the site, I clearly remember seeing the equipment in the distance on the ridge excavating the ditch.

I may have completed my assignment in the company before the ditch was ever used for disposal purposes, I can't be sure. I do not recall ever being told what was going to be buried in the excavation or personally sending any soldiers to the site after it was constructed. As we had many projects from Camp Carroll to Pusan, it is possible materials were buried while I was away visiting a remote construction site. However, if materials were to be buried, it is credible that Specialist House could have been involved in those operations as he operated the type equipment that would be used in such operations.

b6
[redacted]

CSS-
1830

Budde Stmt

If the Department of Veteran's Affairs wishes to ask me anything further about my recollections, they may feel free to contact me at by mail at the above address or by calling me at any of the following phone numbers.

Home: [redacted] b6 Work: [redacted] b6 Cell [redacted] b6

Sincerely,

[redacted] b6

Colonel, US Army (Retired)

CSS [redacted]

1831

T/c with [redacted] b6 ublic works director of Allen, TX.

He denies that he has any more information than that which he included in his letter. I mentioned that we thought he might have more to say if subpoenaed, but he said that was not the case. He was emphatic on that point.

He remembers that more than one "slit trench" was dug and that another agency, which he could not remember, was responsible for what went in the trenches. He said that the only people who would know what went in those trenches were the people who put the material in, and the people who covered it up. He was not present went anything was dumped in the trenches and he doesn't know what went in the trenches. He shipped out before the trench project was completed.

He had high praise for Steven House and held him in high regard as a person who would do anything for his superiors in the Army. Without being asked, he reiterated that he had never been asked to make anything up by Mr. House.

Mr. [redacted] b6 currently is service connected and 70% disabled with bladder cancer, is a retired O-6 (Colonel) who has had service in the Army Corps of Engineers. He is quite outspoken and willing to add or contribute anything else that he knows.

[redacted] b6

OFFICIAL SEAL
STATE OF WEST VIRGINIA
NOTARY PUBLIC
[redacted] b6
BB&T
1605 HARRIS HIGHWAY
PARKERSBURG, WV 26101
My Commission Expires July 3, 2016

PAGE ONE

10. 20. 06.

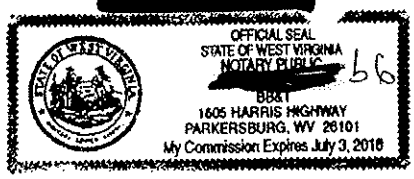
Subject: CAMP CARROLL
WAEGWAN SOUTH KOREA
DELTA COMPANY
802ND ENGINEER BATTALION
(COMBAT) (HEAVY)
EARTH MOVING Platoon
1978

I [redacted] b6, hereby swear to the following events, in the late spring early summer of 1978, of events under order while stationed at the above Army Depot.

In the spring we were told of a "move" that we to be a part of. For two weeks we fell out for formation in our Nuclear Biological Chemical suits, with gas mask, and were tested on proper wear, each day.

At this time, after apr. 2wks, it was raining, and we were ordered not to wear our NBC gear, due to the rain. We left our motorpool with our 20ton Dump trks and went to the part of the post, Known as the war surplus area.

[redacted] 56



We proceeded to a brick building, which had a loading dock of a concrete front. In this building was appx. 250 barrels, which were olive drab green, 55 galon, with an orange stripe and yellow lettering, which read - Chemical, AGENT, TYPE: ORANGE, dated 1967 and read for the Republic of Viet Nam.

These barrels, were leaking and rusted, and we were told to hand move them into the back of the dump trucks, which we had backed up to the dock, with the tail gate, chained, in the down/open position.

These barrels were then transported across the post/depot to an old airfield, in which the previous two weeks, we had dug a hole, appx. 150 yds long, 25 to 30 feet wide, and 25 to 30 feet in depth.

We then dumped these barrels in the hole, until all 250 barrels had been moved. The hole stayed open for about six months, at which time there were outside units from within Korea, that dumped other barrels and equipment, both Iran and again. 1634

1634

[redacted] b6

OFFICIAL SEAL
STATE OF WEST VIRGINIA
NOTARY PUBLIC
[redacted] b6
1605 HARRIS HIGHWAY
PARKERSBURG, WV 26101
My Commission Expires July 3, 2018

Page Three

Many of us, within weeks, developed skin rashes, consisting of red colored, odd size, gourter shaped raised bumps.

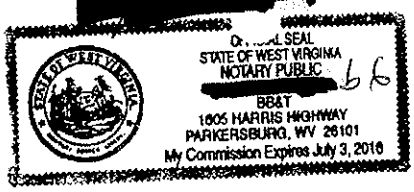
I left Korea in December of 1978, at was stationed at Aberdeen Proving Ground Maryland, where I became the main bus driver to Walter Reed Army Hospital in Washington D.C.

At this time, I went to an Army Doctor, name unknown, rank of Captain and told Him what I had participated in. He looked at me has if I was nuts, but issued me a Selsun brown Shampoo, which I used for several months. The rash did clear up, but does reappear in hot muggy weather.

I also swear the Steven F. House who was also in my platoon as a Spc 4th class, participated in this move as a dozer, bucket, and fork lift operator.

We also stood in line together, during the NBC training at this time, and noticed the same soldiers had white filters, and some had orange filters in our gas mask. This when questioned was never answered.

[redacted] b6



I had access to my medical records from this time, throughout my time at Aberdeen Proving Ground MD, and also while stationed at Manheim FRG, for three years, and turned them in at Fort Campbell KY, around January 1995. Upon ETS in March of 1985, I was told by Ft. Campbell Military personnel and the hospital, that they had no records of my medical files, and that they had been lost.

[redacted] b6

10.20.06.

133 Lake Street
Parkersburg WV. 26101

ph. home. [redacted] b6
cell [redacted] b6

CPT [redacted]/ama/[redacted]

EHEA-EE

18 January 1983

MEMORANDUM FOR RECORD

SUBJECT: Hazardous Materials Special Study, Project No. 37-91-0206-83, Camp Carroll, Korea, 29 November-11 December 1982

1. A meeting was held at Camp Carroll, Korea, on 30 November 1982, to discuss hazardous waste management in Korea, especially as it related to Camp Carroll. This meeting was arranged as a result of an earlier visit to the US Army Pacific Environmental Health Engineering Agency (USAPACEHEA) by COL J. E. Jones, Commander, US Army Material Support Command-Korea and Camp Carroll (USAMSC-K and CC). The following personnel attended the meeting:

a. COL J. E. Jones, Commander, USAMSC-K and CC.

b. LTC [redacted] Commander, USAPACEHEA.

c. CPT [redacted] Commander, 5th Preventive Medicine Unit (5PMU), LB Det, Taegu, Korea.

d. CPT [redacted] Sanitary Engineer, 5PMU, LC Det, Yongsan, Korea.

e. CPT [redacted] vironmental Science Officer, USAPACEHEA.

2. Subject matter discussed during the meeting included:

a. A review of previously documented Camp Carroll hazardous waste disposal problems, as described in a letter to Commander, USAMSC-K and CC, subject: Review of the Camp Carroll Chemical Disposal Problem, dated 24 November 1982 (inclosure).

b. The possibility of one centralized hazardous waste site being established within Korea. COL Jones felt this site would most probably be located at Camp Carroll. It was not known if this would be a storage site, a disposal site, a recontainerization and retrograde point or if it would be designed in some other configuration. A decision on locating such a site had not been made, but Col Jones desired to have as much advance coordination and planning done as possible to prevent a recurrence of the type of problems experienced in the past at Camp Carroll (inclosure).

c. It was mentioned that some hazardous wastes, other than those previously removed from the site identified in the inclosure, may have been

buried at Camp Carroll. COL Jones did not feel that any investigation would be necessary in the absence of any currently known problems associated with the alleged past burials of chemicals at Camp Carroll. The point was raised of a possible need to monitor groundwater by drilling observation wells around the burial sites, in particular, and the installation, in general. There was no existing documentation pertaining to unauthorized burial of hazardous wastes at Camp Carroll, although there was an institutional memory that some burial did occur, as delineated in paragraph 3 below. COL Jones indicated that previous searches had been fruitless in locating documents relating to any unauthorized burial of wastes at Camp Carroll.

3. A tour of three sites on Camp Carroll where unauthorized burial of wastes had, reportedly, occurred was made with a representative of the Sub-Area Facilities Engineer (SAFE) at Camp Carroll just prior to the 30 November meeting with COL Jones. Personnel on this tour included the SAFE representative, LTC [redacted], CPT [redacted], CPT [redacted], CPT [redacted] and 1LT [redacted] and SP5 [redacted] from USAPACEHEA. The materials buried at two of the sites near Building 520 were, reportedly, primarily boxes and crating materials. The site near Building 580 was more likely to contain hazardous materials, as indicated by a description of a fire started by a crawler tractor during covering operations (circa 1975) and the lack of grass cover over the site (noted during the tour), although the area surrounding the site had grass cover. It can be concluded, therefore, that the potential exists that even more unauthorized burial sites may be located on the installation. A visit to the site described in the inclosure, revealed that ground cover had not yet been well established, that some general domestic-type waste products were laying on top of the ground and that soil erosion was occurring.

4. Contact was made with Mr. [redacted] a geologist with the Far East District (FED), Corps of Engineers, in Tongsan on 2 December 1982, to obtain information as to the availability of drilling equipment for drilling monitoring wells or supporting USAPACEHEA in conducting feasibility studies in selecting a site for hazardous waste operations. Mr. [redacted] indicated that their drilling equipment could normally be made available within thirty days and they had the capability both for drilling monitoring wells and supporting future feasibility studies. Mr. [redacted] also felt that Camp Carroll may be a poor site for hazardous waste operations due to the geology of that area.

5. CPT [redacted] USAPACEHEA, telephoned MAJ [redacted] Chief, Waste Disposal Engineering Division, US Army Environmental Hygiene Agency (USAEHA), Aberdeen Proving Ground, Maryland, AUTOVON [redacted] on 28 October 1982. This contact was made to determine what support would be available to this Agency in a hazardous waste site selection and design process. MAJ [redacted] indicated USAEHA would be readily available for telephonic consultation and would normally provide field support within sixty (60) days. USAEHA would be able

EHEA-EE
SUBJECT: Hazardous Materials Special Study, Project No. 37-91-0206-83 18 January 1983

to provide all necessary support for site selection and design of hazardous waste/materials management storage and disposal facilities.

6. The point of contact at USAPACEHEA for coordination or additional information on this subject is CPT [redacted] AUTOVON (Japan) [redacted]

b6 b6 b6

1 Incl
as

[redacted]
CPT, MS
Environmental Science Officer

CF:
HQDA DASG-PSP
HQDA DAEN-ZCE
Cdr, USARJ (w/o Incl)
Cdr, USAEHA (HSE-M) (2 cy)
Cdr, USAMSC-K & CC (COL Jones) (w/o Incl)
Cdr, 5PMU (w/o Incl)
SAFE (w/o Incl)

ANNEX C
FINAL ~~REPORT~~ INVESTIGATION

ENCL 5 ENCLS 1-11

Camp Carroll Site Questions/Interview w/Mr. Steven House

23 May 2011

Present at the interview:

Army Reps:

-COL Donald Degidio, IMCOM Korea

-Mr. T[redacted] USAEC b6

-Ms. L[redacted] IMCOM Public Affairs – Environmental Branch b6

Veteran Reps:

Mr. Steven House

Mr. Theodore Jarvi, Mr. House's attorney

Answers:

1. When did you arrive at Camp Carroll, when did you leave?
    a. February 1978 thru February 1979
2. What was your unit, rank, duty position?
    a. D Company, 802nd Platoon
    b. Spec 4
    c. MOS 62L-20 (Heavy Equipment Operator)
3. Do you remember your chain of command? (Platoon ldr, company commander....up to highest rank)
    a. Squad Leader – [redacted] b6
    b. Platoon leader - 2LT [redacted] b6
    c. CPT [redacted] b6 ey, Company Commander
    d. Top Sgt [redacted] b6
    e. Doesn't recall any higher ranked officers
4. Please describe what was disposed of at Camp Carroll? and when?
    a. Disposal took place between Spring 1978 (April/May) and Fall 1978

b. Material was in 55 gallon drums and delivered by truck

5. Please describe what it looked like, where it was located, what the area looked like.

   a. Drums – color OD Green

      - Lots of writing on drums in bright yellow or orange
      - Bright yellow or orange bands on the drums
      - Some said 'for province of Viet Nam'

   b. 4 drums to a skid

   c. Air Force delivered additional drums to the area

      - OD Green 55 gallon drums (looked brand new)
      - Same type of markings as described in 'b' above

6. Can you point out where it was disposed? Did it have a special name? Are you aware of the reason why it was disposed?

   a. See maps

7. How long did the transportation and disposal take?

   a. Ditch was surveyed – someone brought in to area to survey

   b. Ditch was dug w/ramps on either end

      - About 1-1/2 semi-trailers wide
      - Approximately ¾ city block long (including ramps)
      - About 30 feet deep
      - Original intent was to back dump trucks into the trench and dump the loads
      - Sides were unstable so drums were dumped into the ditch from the berm
      - Water was present at approximately 3-4' in depth at bottom of ditch

8. How much was disposed? In same location?

   a. Approximately 200-250 drums over initial 10 day disposal period

   b. Ditch was filled with drums and capped as the disposal progressed occurred

   c. Initial disposal occurred over approximately 10 days at a rate of 2-3 loads a day

d. Ditch remained open for approximately 6 months with occasional disposal

9. Where did the containers originally come from?
   a. PFC [redacted] b6 Truck Driver and SGT [redacted] b6 Truck Driver drove the drums into the dump site. Mr. House does not know where they came from.

10. Where were they stored prior to disposal? Did it have a special name? Any other locations where they were stored?
    a. Mr. House did not know

11. What was the condition in storage?
    a. Mr. House did not know

12. How were they moved?
    a. Flatbed truck

13. Who was involved with the transportation and disposal?
    a. Truck Drivers: [redacted] b6 and [redacted] b6
    b. Heavy equipment operators: Stephen House and [redacted] b6
       - Mr. [redacted] b6 became ill and was medivac'd out of the area
       - Mr. House continued disposing of the barrels

14. Describe the containers (all the same, any markings)?
    a. What where they made of?
       - Steel 55 gallon drums
    b. If leaking, what did the substance(s) look like/ smell like?
       - Smelled similar to creosote and/or ether – strong chemical smell
    c. If leaking, what percentage of the containers do you think were leaking? Where was it leaking? How much was leaking from the containers?
       - Doesn't recall
    d. If leaking, what did you do with the material that leaked both during transportation and disposal?
       - Doesn't recall

15. Describe how you disposed of the containers?

    a. Length of trench, width, and depth of burial.

        - ¾ city block long
        - 1-1/2 semi trailers wide
        - ~30 feet

    b. Were they still leaking?

        - Yes and some were crushed in the disposal process

    c. How where the containers arranged in the trench?

        - Dumped into the trench – no specific arrangement

    d. What type of soil was excavated? What did you do with the excavated soil?

        - After breaking through initial cap of hard soil, soil consisted of pea gravel and sand
        - Excavated soil was for berm and used to back fill trench after drums were dumped

    e. How did you cover?

        - See above

    f. Were you there long enough to notice if any vegetation grew back?

        - No

16. Are you aware if the containers were removed after they were buried?

    a. No

17. Other topics covered

    a. Mr. House stated he received some chemical burns on his legs from kick-up of dirt while compacting back-fill of ditch

    b. Mr. House stated he discovered ditch had not been completely back-filled in Fall 1978. He noticed thick yellow foam leaching from open end of ditch into soil and crossing road. He also noticed dead birds and grass in the affected areas. He reported through his chain of command as was directed to close the ditch. Closing ditch took approximately ½ day.

c. Mr. House also reported suspect area between helipads (see map). The soil looked discolored. Fumes coming from the soil caused burning in throat. He reported having several chest X-rays as a result of this exposure.

d. Mr. House reported that in addition to the barrels, a trailer with bright yellow barrels with a tarp on it along with two old fuel pod trailers were buried at the site.

DEPARTMENT OF THE ARMY
U.S. ARMY MATERIEL SUPPORT CENTER, KOREA AND CAMP CARROLL
APO SAN FRANCISCO 96460

EANC-MSC-S 14 April 1978

SUBJECT: Letter of Appreciation

THRU: Chief, Storage Division
Supply & Transportation Directorate
APO 96460

TO: Private First Class [redacted] b6
[redacted] b6
Warehousing Branch
Storage Division
Supply and Transportation Directorate
APO 96460

1. The purpose of this letter is to express my personal appreciation and complete satisfaction for the excellent cooperation and assistance you rendered in our recent CNI cleanup program.

2. The complete success of this project must be atrributed in large part to your aggressive support. This program resulted in the successful processing and disposition of more than 3,000 CNI's and greatly aided our goal of achieving greater efficiency in the Directorate for Supply and Transportation.

3. Again thanks for a job well done.

[redacted] b6
MAJ, QM
Director for Sup & Trans

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EANC-MSC-S (10 Apr 78) 2nd Ind
SUBJECT: Letter of Appreciation

DA, US Army Materiel Support Center-Korea & Cp Carroll 14 April 1978

TO: Private First Class [redacted] b6
Warehousing Branch, Storage Division, Dir for Sup & Trans
US Army Materiel Support Center-Korea, APO 96460

1. It is indeed a pleasure to forward the basic laudatory comments concerning your performance in the Storage Division. I add my personal congratulations and thanks to that of Captain [redacted] b6 for your truly superb performance of duties over the past twelve months. You consistently demonstrated initiative, ingenuity, and technical competence in meeting difficult job requirements which are normally only associated with individuals much senior in grade and experience.

2. Again thanks for the many fine contributions you have made as a member of this directorate. You truly leave this a better organization through your major contributions to increased efficiency and effectiveness in storage operations.

b6
[redacted]
MAJ, QM
Director for Sup & Trans

Camp Carroll Site Questions

23 May 2011 (v1)

Interview with Mr. [redacted] and USAG Team Major [redacted] and Mr. [redacted]

14 June 2011 (Korean Local Time)

1. When did you arrive at Camp Carroll, when did you leave?

Mr. [redacted] arrived in April 77 and left around April 1978.

2. What was your unit, rank, duty position?

Mr. [redacted] was 19/20 years old at that time. He was a soldier with MOS 76V and was a PFC at the time. He was assigned to MSC HQ and was in charge of "Warehouse 2." He was licensed to drive/operate all types of heavy equipment on hand.
ADD--I was used for special projects, such as the CNI (could not identify) and the major re-warehousing of the outside storage area, to include S671, S672, S673, S674 and what is now a fenced off area around S664, as well as some of the other outside storage areas.

3. Do you remember your chain of command? (Platoon Leader, company commander....up to highest rank)

CPT [redacted] OIC in warehouse division
NCOIC in HQ CO—MSG [redacted] and he was relieved by MSG [redacted]
OIC in Warehouse—CPT [redacted]
Director of S&T—MAJ [redacted] Mr. [redacted] received a letter of appreciation from MAJ [redacted] for the "C N I Project (Could Not Identify)."
COL Elam—in charge of Camp Carroll
CO CDR—1LT [redacted]

4. Please describe what was disposed of at Camp Carroll? And when?

Only thing Mr. [redacted] remembers is that they were some "chemical stuff." He remembers reading a paperwork that read "from Vietnam" or "to Vietnam." Maybe he thought it was napalm, but others told him, no.
Mr. [redacted] was not certain when this took place; he stated that it was warm weather probably in the later part of 1977. (Later he clarified that it was hot weather.)
ADD-- Appox. 3000 items were removed from stock, some from inside and outside storage areas. Some were hard parts that could not be identified or had met its self life. Some items were re-packaged and returned to stock, some were sent to the DMRO. Then there was stuff from the chemical area S671, 672, 673 and S674. There was a variety of sizes and packing, from small box type to maybe quart, gallon size up 55 gallon drums. Because of exposure and age and a lot of bad containers, items from the chemical storage were not sent to DMRO. There was a command decision made to have a trench dug out and things were buried there. As I recalled

there were many different items like paint, solvents, bug spray, fertilizers, weed killer and only God know what else. I remember containers that were leaking or were damaged while moving and leaked. I do remember what I recall as a chemical smell, but was even at the storage site which was also in the dirt. I recall several drums (guessing 4-10 drums),
This either had paper work or was painted as to either going to or coming from Vietnam. I don't recall all of details but I remember thinking it was napalm, because that's was all I knew of, but somebody, I think he was E-6 or E-7 lifer kind of guy who served in Vietnam, told me it was agent orange, I don't recall the nomenclature or did not know what it meant. These drum went into the ditch, as well as many other 55 gal. drums. I was thinking this took place in the later part of 1977, but after looking at the weather pattern there I could not really tell you, I would say it was somewhere between warm and hot days.

5. Please describe what it looked like, where it was located, what the area looked like.

Containers varied from 5 gallon pail to pottery to 55 gallon drum. They were all located in the warehouse and some were leaking.

The warehouse was a shed area outside in the dirt maybe with a gravel base.

6. Can you point out where it was disposed? Did it have a special name? Are you aware of the reason why it was disposed?

D. Co., 802nd Engineer Company dug a trench. According to the map named "CAMP CARROLL KS116 SITE MAP" the trench measuring approx. 100 yards long and 3-4 wooden pallets wide and approx 10 feet deep was dug running north along the Nebraska Ave. where Bldg. S-530 is located. There was no special name associated with it. There was no reason given by Mr. [redacted] ther than being told to bury them because some were leaking. b6
ADD-- I would now say the trench was maybe 50 to 60 yards or 150 to 175 feet long and the reason things were buried because containers were decaying, items were past self life or not needed. Shipping to DMRO would have been very insecure.

7. How long did the transportation and disposal take?

The re-warehousing and **palletizing them took him more than 30 days and the burial took about three days.**

8. How much was disposed? In the same location?

Some products were palletized (about half) and some were not. They were all buried in the trench by Mr. [redacted] b6

ADD-- I believe all items were placed on pallets for the ease of moving and placed in trench with a rough terrain forklift. I would guess to say the trench was slightly more than half filled.

9. Where did the containers originally come from? b6

They were all from the warehouse Mr. [redacted] new.

ADD--They were from the open storage shed area, and because of many different products it came from many different vendors, and the 6-12 drums I only remember them as having something to do with Vietnam. My guess would be that they must have been going because I could not see the Army shipping this back at the end of the war.

10. Where were they stored prior to disposal? Did it have a special name? Any other locations where they were stored?

There was no other special name other than the warehouse he worked in.

ADD-- Outside storage area S671, 672, 673 and S674 at least the 55 gallon drums, there may have been a small of some amount of things coming out of warehouse #3

11. What was the condition in storage?

Some were loose and not palletized--a lot of them were leaking.

ADD-- Some decay of containers and drums, some seepage of liquids. Some things may have been bumped into with some damage.

12. How were they moved?

They were moved from the warehouse to the trench. Mr. [redacted] b6 ated that there was a truck that moved all this.

ADD-- Pallets were loaded on to a truck in the storage area and off loaded at the trench and buried. The truck would return to the staging area and re-load, and then return to the trench.

13. Who was involved with the transportation and disposal?

Mr. [redacted] b6 es not recall any specific information about transportation. He stated that he was the only one who used the heavy machinery to bury them in to the trench. The 802nd Engineer Company covered the trench afterwards and leveled out the remaining excavated soil around the area.

ADD-- This was not a secret mission, but more of a need to know, but I do not remember any Korean workers being involved and I am sorry I do not remember any other names. I can also tell that the only thing the 802nd did was the dig out and cover over the trench.

14. Describe the containers (all the same, any markings)? **Mr. [redacted] b6 does not know.**

ADD-- If we asking about the 6-12 drums of what I believe to be "Agent Orange" then I would say, yes to them all being the same with the same marking. I do not remember other details about them.

a. What were they made of? **Mr. [redacted] oes not know.**

b. If leaking, what did the substance(s) look/smell like? **Some containers were leaking and they smelled like pest control products. One time Mr. [redacted] an over a container, it puffed with white powder stuff.**

ADD--Because we are talking about something that happened some 33 years ago, my memory is not serving me with all of the details. Because there many different products I could just say that it had a chemical smell to it. There were some liquids and some solids materials. I would say in the beginning there was what I would call seepage, but after moving things, loading and unloading it fair to say damage was done to more containers and this was the cause of the leakage. It didn't seem like it mattered this stuff was getting thrown away. I remember things fell off of the pallet and being ran over with the forklift, again some solids and some liquids

c. If leaking, what percentage of the containers do you think were leaking? Where was it leaking? How much was leaking from the containers? **Mr. [redacted] oes not remember.**

ADD--Overall it was a small percentage that was leaking.

d. If leaking, what did you do with the material that leaked both during transportation and disposal? **Mr. [redacted] d not mention what he did with the leakage, other than he didn't take much attention to it. He mentioned that his clothes were all contaminated with leaking materials at one time; he did give too much thought as to what was being exposed to.**

ADD-- One day I went back to mess hall for lunch and my 1st sergeant saw me in this very dirty uniform and asked what I was doing and I told him that I was burying this stuff. He told me to get a clean uniform on and to check out my gas mask and to wear it because "that shit can kill you" Maybe he knew something the others didn't.

15. Describe how you disposed of the containers? **Mr. [redacted] wnloaded the containers from the truck using a forklift drove into the trench and downloaded them.**

a. Length of trench, width, and depth of burial. **The trench was about a football field long. Width was about 3-4 pallets wide. Depth was about 10 feet. It was dug N-S direction. Refer to Question #6.**

ADD--correction in length 50 to 60 yards or 150 to 175 feet long.

b. Were they still leaking? **There were a lot of containers were leaking.**

c. how where the containers arranged in the trench? **Some were palletized and some were not. More than half of the trench was filled.**

b6 d. What type of soil was excavated? What did you do with the excavated soil? **Mr. [redacted] does not know which type of soil was. He stated the soil was pushed to the side temporarily.**

e. How did you cover? **802nd covered back the excavation site with the same soil.**

f. Were you there long enough to notice if any vegetation grew back? **He did not stay long enough to notice the growth of vegetation.**

16. Are you aware if the containers were removed after they were buried? **He does not know.**

Other interesting facts.

A. **He has had Diabetes Type I ever since 37 years old. He was denied a Veterans Administration Claim for Agent Orange since the VA claimed that only Diabetes Type II can be caused by Agent Orange.**
B. **Seeing that Mr. [redacted] (PFC back then) was covered with leaked chemicals, Mr. [redacted] SG shouted, "that stuff can kill you!" Mr. [redacted] does not recall the name of ISG.** b6 b6 b6

I PCS April 1978 to Fort Knox and was there only one week 5-26-78 and being struck head-on by a car on the highway that was knocked out of control by a drunk driver I retired from the Army on 11-1-78 from injuries sustained from that accident. I now have a hip replacement. I suffered from Peripheral Neuropathy as well as weakness in both lower legs every since. Doctors always connect the accident and these problems together. There is no known history of diabetes in my family tree; however I become type 1 at age 37 which is real rare as less than 1% of diabetics in this group.

I am sending an attachment of, Letters of Appreciation, Letters of Introduction and Recommendation for Promotion to help you understand what kind of a soldier I was and how I was in a position to do all that I claim.

I can tell that if I could back and change one this in my life, this incident would be the one. Speaking for myself I do believe that everybody involved in this believed they were doing the best possible. I don't believe people were just taking short cuts, but at least for me, just didn't realize the dangers involved. Today, now understanding the effects of this, I wish I could tell the Korean people how sorry I am. But I would prefer to keep my name out of it. I have nothing to prove. My hopes would be that the stuff the Army claims to have dug up in 78-79 would have been the stuff I was involved with, when the building was put on that spot.

I wish everybody the best possible outcome with this.

The History of the US Department of Defense Programs for the Testing, Evaluation, and Storage of Tactical Herbicides

December 2006

ANNEX C
FINAL INVESTIGA
ENCL 4 TO ENCL 5

Submitted by
Alvin L. Young, Ph. D.

for

Office of the Under Secretary of Defense
[redacted] b6
Crystal Gateway 2, Suite 1500
1225 Jefferson Davis Highway
Arlington, VA 22202

Contract No. DAAD19-02-D-0001
TCN 05204/D.O. 0691

Battelle
The Business of Innovation
Battelle Columbus
Prime Contractor

A. L. Young Consulting, Inc.
Subcontractor

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14. ABSTRACT
Early in 2006, the Department of Veterans Affairs (DVA) requested that the Department of Defense (DoD) provide: "an official compilation of locations and dates outside of Vietnam where the Department used herbicide agents, including Agent Orange, as well as locations and dates where DoD personnel were likely exposed to these agents." The intent of this request was to obtain information that may be important in evaluating the merits of many veterans' disability claims. Various estimates have circulated on the Internet as to the number of sites where veterans may have been exposed to Agent Orange and "other herbicides" used in Vietnam. There is, however, significant confusion by veterans and by the Department of Veterans Affairs as to the distinction between "commercial herbicides" used by the DoD and "tactical herbicides" used by the DoD. The belief that commercially available herbicides were simply purchased from the chemical companies and deployed directly to Vietnam is incorrect and contrary to historical records. Tactical Herbicides were herbicides developed specifically by the United States Department of Defense to be used in "combat operations." The history of the military development and use of tactical herbicides dates to World War II. During the Korean Conflict, the DoD developed the first major tactical herbicide, Herbicide Purple, although never deployed. Subsequently, for Vietnam the DoD developed, tested, evaluated, and deployed five additional tactical herbicides, Herbicide Pink, Herbicide Green, Herbicide Blue, Herbicide Orange, and Herbicide White. This report discusses the history of the development of the tactical herbicides, how they differed from commercial herbicides, and where they were tested, evaluated, stored, used (in the case of Korea in 1968) OUTSIDE of Vietnam. Additionally, the report discusses the final disposition of Herbicide Orange after Vietnam. The report contains 32 leaflets identifying different locations or multiple locations involved in same projects (e.g., Leaflet 19 identifies 5 locations in Texas), or the multiple use of a specific location (e.g. Eglin Air Force

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INSTRUCTIONS FOR COMPLETING SF 298

Base, Florida). A total of 40 distinctly different locations are identified. For each leaflet, a description of the activity is given, an assessment is made of the activity and the individuals involved in the project, and sources of the information are documented.

15. SUBJECT TERMS
tactical herbicides, agent orange, Herbicide Orange, Herbicide Blue, Herbicide White

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE		79	19b. TELEPONE NUMBER (*Include area code*)

1655

INSTRUCTIONS FOR COMPLETING SF 298

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5a. CONTRACT NUMBER. Enter all contract numbers as they appear in the report, e.g. F33615-86-C-5169.

5b. GRANT NUMBER. Enter all grant numbers as they appear in the report, e.g. 1F665702D1257.

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES). Self-explanatory.

8. PERFORMING ORGANIZATION REPORT NUMBER. Enter all unique alphanumeric report numbers assigned by the performing organization, e.g. BRL-1234; AFWL-TR-85-4017-Vol-21-PT-2.

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15. SUBJECT TERMS. Key words or phrases identifying major concepts in the report.

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The History of the US Department of Defense Programs for the Testing, Evaluation, and Storage of Tactical Herbicides

ABSTRACT

Early in 2006, the Department of Veterans Affairs (DVA) requested that the Department of Defense (DoD) provide: "***an official compilation of locations and dates outside of Vietnam where the Department used herbicide agents, including Agent Orange, as well as locations and dates where DoD personnel were likely exposed to these agents.***" The intent of this request was to obtain information that may be important in evaluating the merits of many veterans' disability claims. Various estimates have circulated on the Internet as to the number of sites where veterans may have been exposed to Agent Orange and "other herbicides" used in Vietnam. There is, however, significant confusion by veterans and by the Department of Veterans Affairs as to the distinction between "commercial herbicides" used by the DoD and "tactical herbicides" used by the DoD. The belief that commercially available herbicides were simply purchased from the chemical companies and deployed directly to Vietnam is incorrect and contrary to historical records. **Tactical Herbicides were herbicides developed specifically by the United States Department of Defense to be used in "combat operations.**" The history of the military development and use of tactical herbicides dates to World War II. During the Korean Conflict, the DoD developed the first major tactical herbicide, Herbicide Purple, although it was never deployed. Subsequently, for Vietnam the DoD developed, tested, evaluated, and deployed five additional tactical herbicides, Herbicide Pink, Herbicide Green, Herbicide Blue, Herbicide Orange, and Herbicide White. This report discusses the history of the development of the tactical herbicides, how they differed from commercial herbicides, and where they were tested, evaluated, stored, used (in the case of Korea in 1968) **OUTSIDE** of Vietnam. Additionally, the report discusses the final disposition of Herbicide Orange after Vietnam. The report contains 32 leaflets identifying different locations or multiple locations involved in same projects (e.g., Leaflet 19 identifies 5 locations in Texas), or the multiple use of a specific location (e.g. Eglin Air Force Base, Florida). A total of 40 distinctly different locations are identified. For each leaflet, a description of the activity is given, an assessment is made of the activity and the individuals involved in the project, and sources of the information are documented.

The History of the Development of Tactical Herbicides

INTRODUCTION

The period of use of tactical herbicides in the Vietnam War, 8 January 1961 – 7 January 1971, is a story that begins many years before Vietnam, and it is really a history of the Department of the Defense's efforts to develop vegetation control methods that would have military applications. In 1943, the Department of the Army contracted the University of Chicago to study the effects of a new series of organic compounds, especially 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-triclorophenoxyacetic acid (2,4,5-T) on cereal grains and broadleaf crops. From that research came the concept of military applications of small quantities of such compounds to destroy enemy crops. Subsequently, in early 1945, the Army tested 2,4-D and 2,4,5-T formulations at the Bushnell Army Air Field in Florida. That site is now a FUDS (**F**ormerly **U**sed **D**efense **S**ite) location for the Department of Defense. Although not used in World War II, the concept of vegetation control was not forgotten. In 1952, the Department of Army's Chemical Corps Biological Laboratories at Camp Detrick, Maryland, initiated a major program to develop both the aerial spray equipment and herbicide formulations for potential deployment in the Korean Conflict. Again, although not used in the Korean Conflict, the equipment that had been developed and tested, and the formulated chemicals were both stored on the Island of Guam until the end of the Conflict, after which the equipment was sent to Utah and the drums of herbicide were sent to Camp Detrick. Camp Detrick (now Fort Detrick) continued working on developing deployment systems and herbicidal materials through the 1950s.

The Period from 1945 to 1959: Supporting the Initial Deployment of Herbicides for the Early Years of the Vietnam War

The Tactical Herbicide Spray Systems (fixed-wing, helicopter, and herbicides) developed during this period were available to be tested in Vietnam in 1961. Their successful use during the period from 8 October 1961 through 18 March 1965 (the Initial Program Development Phase) resulted in the United States Department of Defense approving a major combat role for Tactical Herbicides from 29 March 1965 to 7 January 1971 (the Operational Phase). As noted above, the Initial Program Development Phase depended heavily on the limited research into both aerial spray systems and tactical herbicides that the United Army Chemical Corps had carried out from the end of World War II (1945) through 1959. The Leaflet Series from Site 1 to Site 9 provide both the history and successes of these research projects. For each site, an "**Activity Description**" is given to place in context what was occurring at the time and the intent of the project. The "**Assessment**" section of each Leaflet is intended to provide details about the human element, including who was involved and what they did with respect to the herbicides

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being evaluated, i.e. potential exposures. The section on "**Sources**" provided the information that was described and assessed.

The Period from 1963 to 1967: Developing the Spray Systems and Multiple Herbicides for Supporting Combat Operations in Vietnam

The second period was the period in which new spray equipment and new formulations of tactical herbicides were developed and thoroughly tested in different geographical locations that were applicable to the subtropical and tropical conditions encountered in Vietnam. This research supported the "Operational Phase" of the Army Chemical Corps and the Air Force Operation RANCH HAND deployment of tactical herbicides in the combat environment of Vietnam. The Leaflet Series from Site 10 through Site 21 describe the development of various aerial spray systems at Eglin Air Force Base, Florida, and the Dugway Proving Ground, Utah, for the Army Chemical Corps (helicopters and a proposed fixed-wing Defoliant System), and the Air Force C-123U modifications for RANCH HAND combat spray missions. In addition, this series of Leaflets describes the continual efforts of the Army Chemical Corps Laboratories at Fort Detrick to develop and test new tactical herbicides, including fine-tuning the rates of applications required to control the vegetation encountered in Vietnam and throughout Southeast Asia.

The Use of Tactical Herbicides in Korea in 1968, and the "Camille" Incident in Mississippi in 1969

The only "military use" of tactical herbicides "outside" of Southeast Asia was in 1968 when the Korean and US Governments agreed to provide Herbicide Orange and Herbicide Blue for vegetation control adjacent to the Demilitarized Zone in Korea. Leaflet 22 describes this activity and the involvement of Korean and US military personnel. Leaflet 23 describes the incident in August 1969 at Gulfport, Mississippi where hundreds of drums of Herbicide Orange and Herbicide Blue were destroyed or lost due to the damaging winds of Hurricane "Camille." This Leaflet also assesses the involvement of personnel from the Army Corps of Engineers and the Air Force Logistics Command in the cleanup operations.

The Period from April 1972 – March 1977: Disposal Options for the Surplus Herbicide Orange Remaining After the Vietnam War

This time period was the period in which the military evaluated various options for the destruction of the surplus Herbicide Orange that was returned to the United States in April 1972 from Vietnam (Operation PACER IVY), or was in storage at the Naval Construction Battalion Center (NCBC), Gulfport, Mississippi in 1969. In August 1966, the United States Air Force Logistics Command took over the responsibility for managing the growing and continued procurement requirements for tactical herbicides in Southeast Asia. With the abrupt cessation of the use of Herbicide Orange in Vietnam in April 1970, the 7th Air Force in Vietnam was given the task of consolidating the remaining Herbicide Orange stocks in Vietnam (Operation PACER IVY), and

transferring those stocks to Johnston Island, Central Pacific Ocean. The responsibility for maintaining those "surplus" stocks of Herbicide Orange and disposing of them in an environmentally and publicly acceptable manner was given to the Air Force Logistics Command. Leaflet Series 24 to 30 describe the many options for the final disposition of Herbicide Orange. The importance of identifying these options, and hence the preparation of the Leaflets, was because of the active involvement of Active Duty military personnel. Moreover, the Leaflets provide a unique view of the history of the disposal of Herbicide Orange.

The Period From May 1977 to December 2004: Operation PACER HO and Site Monitoring and Reclamation of the Storage Sites at NCBC and Johnston Island

After reviewing the technical and scientific data obtained from the studies of the various options for the disposition of Herbicide Orange, and weighing of the costs in both economic and environmental terms, the Department of Defense made the decision to destroy all of the remaining stocks of Herbicide Orange by at-sea incineration. The operation to dispose of the "surplus" Herbicide Orange at the Naval Construction Battalion Center, Gulfport, Mississippi, and Johnston Island, Central Pacific Ocean was named Operation PACER HO. The Air Force Logistics Command used the term "PACER" to describe the operational movement of materiel. The "HO" referred to "Herbicide Orange". Leaflets 31 and 32 describe Operation PACER HO for both the inventories at the NCBC and at Johnston Island. The importance of documenting this military operation is because hundreds of Active Duty military personnel were involved in the activity. With the completion of the removal of the drums of Herbicide Orange at the NCBC and Johnston Island, the responsibility for monitoring the residues and environmental impacts of those toxic residues was done by Active Duty military. In February 1989 and December 2004, final corrective measures at the NCBC and Johnston Island, respectively, were completed under the Department of Defense Environmental Restoration Program.

The Distinction Between Tactical and Commercially Approved Herbicides Used in the Vietnam War

There exists significant confusion as to how herbicides were selected by the military to be used in the defoliation program in the Vietnam War The belief that commercially available herbicides were simply purchased from the chemical companies and deployed directly to Vietnam is incorrect and contrary to historical records.

The Military Development and Deployment of Tactical Herbicides

Tactical Herbicides were herbicides developed specifically by the United States Department of Defense to be used in "combat operations". The history of the military development and evaluation of tactical herbicides was described in the previous section. The testing of large volume aerial systems in 1952 and 1953 using Air Force B-29, B-50, and C-119 aircraft, and spraying a mixture of 2,4-D and 2,4,5-T, proved that military aircraft and tactical herbicides could be potentially used in a combat environment. The mission to develop additional tactical herbicides and new delivery technology was assigned to the US Army Chemical Corps, and specifically to the Crops Division of the Biological Warfare Laboratories (subsequently, the Plant Sciences Laboratories) at Fort Detrick, Maryland. The program involved the evaluation of thousands of compounds for herbicidal activity. In addition, the US Army with the active participation of the Air Force and Navy continued engineering development of delivery technology. When the Air Force accomplished prove-out and acceptance testing of the large-capacity (1,000 gallons) spray system (known as the MC-1 or Hour-glass Spray System) it was immediately sent to Guam, along with 5,000 drums of a concentrated mixture of technical butyl esters of 2,4-D and 2,4,5-T called "Purple", although neither the Spray Systems or the herbicides were used. After the close of the Korean Conflict, Fort Detrick scientists were involved in 1957 with tests showing the herbicidal activity of cacodylic acid (an organic arsenical) on rice and grasses, and with the evaluation of aerial application tests with mixtures of 2,4-D and 2,4,5-T at Fort Ritchie, Maryland (1956), Dugway, Utah (1959), and Fort Drum, New York (1959) (see Leaflets 6, 7, and 8).

In early 1961, the US military initiated Project AGILE, a project designed to provide technical information on the chemical means of controlling vegetation that could be applied to military operations in South Vietnam. The tactical problem to which research was directed was the development of chemicals that could rapidly control a broad range of botanical species. Once again the Department of the Army's Plant Sciences Laboratories at Fort Detrick, Maryland was given the responsibility, but this time the goal was to determine the technical feasibility of defoliating jungle vegetation in South Vietnam.

In late 1961, a test program for evaluating tactical herbicides for vegetation control in South Vietnam was approved for the Air Force. With the full concurrence and support of the Republic of Vietnam and the Vietnamese Air Force, a project under the code name operation RANCH HAND was initiated. Operation RANCH HAND was the USAF operation responsible for the tactical fixed-wing aerial application of herbicides from UC-123 Aircraft. Operation RANCH HAND began 7 January 1962, and terminated 7 January 1971, exactly nine years to the day from the arrival of the first RANCH HAND aircraft at Tan Son Nhut airport. The military justification, and hence the mission for the deployment of tactical herbicides by RANCH HAND, was to improve combat visibility in enemy controlled or contested jungle areas in order to expose infiltration routes, base camps, weapon placements, and storage sites of the Viet Cong and the regular Armed Forces of the Democratic Republic of Viet Nam. Tactical herbicides were also used along lines of communication, riverine transportation routes, around base perimeters, and also for crop destruction.

The first tactical herbicides selected for evaluation in Vietnam were Purple, the 2,4,5-T formulations of Pink and Green, and the powder form of cacodylic acid identified as "Blue". None of these products were commercially available; thus, following the publication of "military specifications", for the formulation, packaging, labeling of drums (including a 10-inch colored band around the center of the drum identifying the tactical herbicide), and shipment, these herbicides were purchased by the Defense Federal Supply Center (later the Defense Supply Agency), Richmond, Virginia via competitive bids. The United States Air Force Logistics Command took responsibility for the arrangements of the shipment of these tactical herbicides to the Republic of Vietnam.

Recognizing the continuing mission in Vietnam for tactical herbicides, the Plant Sciences Laboratories maintained an active program of testing and evaluating chemicals for potential use in Vietnam. Three major "Defoliation Conferences" (1963, 1964, and 1965) were sponsored by Fort Detrick. Plant Sciences Laboratory personnel simultaneously conducted field tests in Puerto Rico, Thailand, New Brunswick, and in the States of Alabama, Arkansas, Florida, Georgia, Hawaii, Maryland, and Texas. With the exception of Texas and Puerto Rico, only personnel from the United States Department of Agriculture (USDA) identified and visited the test sites, the responsibility for the testing protocol and spray operations rested with US Army or US Air Force personnel. The USDA had no regulatory authority over the selection or use of herbicide formulations developed by the Department of the Army. These field tests resulted in the selection of a liquid formulation of cacodylic acid (Herbicide Blue), a picloram-2,4-D formulation (Herbicide White), and a 50:50 mixture of an n-butyl formulation of 2,4-D and 2,4,5-T (Herbicide Orange). Following publication of "Military Specifications", these new "Tactical Herbicides" were purchased directly by the Department of Defense for use in Vietnam. These new tactical herbicides had a 3-inch colored band around the center of the drum, in addition to a brief description, the Transportation Control Number (TCN) and final destination in Vietnam.

Operation RANCH HAND involved modifications of standard military aircraft and development of sophisticated aerial spray equipment. It also required a military cadre of

highly trained air and ground-support crews. The training of aircrews, development of the interface between the aircraft and the spray equipment, and test and evaluation of the aerial spray systems were the responsibilities of the USAF Air Development Test Center and the Air Force Armament Laboratory, Eglin AFB, Florida.

The Air Force Armament Laboratory at Eglin AFB, Florida, the Air Force Environmental Health Laboratory, at McClelland AFB, California, the Air Force Occupational and Environmental Health Laboratory, Kelly AFB, Texas, the Plant Sciences Laboratory at Fort Detrick, and the United States Army Environmental Hygiene Agency, Aberdeen, Maryland, were responsible for determining physical properties, efficacy, toxicology, safe handling procedures, and actions to be taken for spills, environmental contamination, and disposal for all of the tactical herbicides.

Helicopters were used in the test phases of the tactical herbicide spray operations (1961 –1965), and were owned and operated by the Vietnamese Air Force. In September 1961, the Air Force Special Air Warfare Center, Eglin AFB, Florida, provided Army H-34 helicopters, spray systems, and aircrew training to the Vietnamese Air Force for tactical herbicide operations. Later the US Army and Marines used specially designed equipment developed by the US Navy at the Medical Field Research Laboratory, Camp LeJeune North Carolina, that could temporarily be attached to UH-1 helicopters for conducting spray projects around base perimeters and in other limited areas. The Department of the Army assigned a Chemical Office (J3-09) to the Military Assistance Command, Vietnam (MACV) to coordinate "operational aspects and plans" involving the use of the tactical herbicides by US and Vietnamese military units. In 1966, the US Army deployed the first (of 22) Army Chemical Corps units to South Vietnam. These units were responsible for the storage, handling, mixing, and application of riot control agents (tear gas), burning agents, and herbicides by the US Army. Men serving in these units performed duties associated with storage, preparation, and the ground and helicopter applications of vegetation control chemicals, as well as equipment cleaning and maintenance. The training of the Army Chemical Corps personnel to handle herbicides was the responsibility of the Army Chemical Corps Training Center at Fort Leonard Wood, Missouri.

The Defense Supply Agency (DSA) procured all tactical herbicides. DSA provided the 55-gallon drums and arranged for all transportation (primarily by rail) of the drums from the chemical companies manufacturing the herbicides to the port of embarkation. The chemical companies were selected on the basis of competitive bids and DSA provided the specifications (developed by the Army Chemical Corps) required to be met by the manufacturer.

Summary

The Herbicide Purple, Herbicide Pink, Herbicide Green, Herbicide Orange, Herbicide Blue, and Herbicide White were developed as "Tactical Herbicides". The United States Army's Plant Sciences Laboratories at Fort Detrick, Maryland, were responsible for the spraying, testing, and evaluating of tactical herbicide candidate formulations at numerous

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sites throughout the United States, and in Puerto Rico, Canada, and Thailand. The Plant Sciences Laboratories were also responsible for establishing the "Military Specifications" for those herbicides selected to be used as "Tactical Herbicides". The ground and aerial spray equipment were developed by the Department of Defense to support tactical combat military operations in Southeast Asia. The Department of Defense provided the training for the Air Force aircrews, ground based personnel, and the Army Chemical Corps personnel that had responsibility for handling and spraying of the tactical herbicides. The selection and use of the tactical herbicides were exempt from USDA regulatory oversight, or from the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

The Role of the Armed Forces Pest Management Board

On 17 November 1956, Department of Defense Directive 5154.12 established the Armed Forces Pest Control Board (AFPCB) [subsequently The Armed Forces Pest Management Board (AFPMB)]. The purpose for establishing the AFPCB was to provide oversight of the DoD's pest management programs on its more than 600 world wide military installations. At the time the Board was established, the Department was using millions of pounds of commercial pesticides on these installations. The DoD Directive required that the Board be composed of members from the Army, Navy, Air Force and selected Defense Agencies (a total of 20 members). The Board was also to have 24 liaison members and 25 non-DoD Agency representatives. The Board established 8 Standing Committees: Environmental Impact, Equipment, Quarantine, Medical Entomology, Pesticides, Real Property Protection, Stored Products, and Training, Certification, and Manpower. In August 1961, the Department of Defense, via a Memorandum of Understanding, established with the USDA a support program that among other responsibilities provided the research, recommendations, and specifications of pesticides that were suitable and met the need for DoD use.

The Armed Forces Pest Control Board required all DoD agencies to use pesticide formulations that had "Federal Specifications", with the labeling and use directions approved by the Pesticides Regulation Branch of USDA (now EPA), and in full compliance with the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). As previously noted the "Tactical Herbicides" were required to meet "Military Specifications". There are four distinct "types of specifications". These are: (1) Purchase descriptions; (2) Army, Navy, and Air Force Specifications; (3) Military Specifications; and; (4) Federal Specifications. Purchase descriptions are merely descriptions of the material desired and are used for filling small needs or for materials that are needed on an emergency basis. They are issued by all government agencies and are of a temporary nature. Army, Navy, and Air Force Specification cover items specific to one of these military services (e.g., a biocide for ship hulls). Military Specifications are complete documents and are used when the need for the material is confined to a specific military operation (e.g., the Tactical Herbicides used in combat operations in Vietnam). The AFPCB adopted the policy for the Department of Defense to recommend that any pesticide formulation that has uses in civilian agencies be issued as a "Federal Specification". These types of pesticide are to be issued by the General Services

Administration (Tactical Herbicides were the responsibility of the Defense Supply Agency).

By 1966, the AFPCB strictly controlled the kinds and forms of pesticides available under "Federal Specifications" and on the military supply list. New pesticides, before being considered by the Board, had to be recommended by the US Department of Agriculture, the Fish and Wildlife Service, or the Public Health Service, and the proposed use had to have been approved by all three of these organizations. In February 1967, the Federal Committee on Pest Control (FCPC) was established. All Federal pest control activities were placed within the purview of the Committee. The Committee was composed of two members from each of the Departments of Agriculture; Defense; Health; Education, and Welfare; and Interior. Before a pesticide was approved for use in the United States, or by a Federal Agency, it had to be reviewed by the FCPC. The DoD's "Tactical Herbicides" were exempt from this approval and oversight process. However, all other herbicides used by the Department of Defense were required to meet this approval process. The significance of this action was that herbicides used in 1967 to 1970 on the more than 600 military installations managed by the Department of Defense required approval by both the AFPCB and the FCPC (after 1970, the registration and oversight of commercially available pesticides was the responsibility of EPA). This requirement applied to herbicides used in Vietnam that were NOT TACTICAL HERBICIDES. Thus, herbicides used on Allied Bases in Vietnam around buildings, in equipment storage sites, and along interior roads came under the requirements of the AFPCB. The responsibility for the purchase and application of commercial pesticides on these installations was the Base Civil Engineer, NOT the Army Chemical Corps. Tactical Herbicides were NOT approved for these uses. The insecticides used in Operation FLYSWATTER (the aerial application of insecticides to control mosquitoes in Vietnam) were under the Military's Disease Prevention Program and were approved by the AFPCB.

With the establishment and functioning of the AFPCB, anytime a DoD Military Base, e.g., Eglin AFB, Florida, Andersen AFB, Guam, or Osan AB, Korea, requested the use of a herbicide to control plant pests, the selection of the herbicide must have been approved by the Board. Locally purchased pesticides were to be approved by the Command Entomologist. Moreover, the application of the herbicide had to be done by a Board "certified" (trained) applicator, and with equipment that had been approved by the USDA, and under the supervision of the Base Civil Engineer. The Department of Agriculture's Agricultural Research Service (ARS), and the Cooperative State Research Service (CSRS) provided critical support to the development of pesticides that were subsequently recommended and approved for use by the AFPCB. The Board DID NOT work with the chemical companies manufacturing the pesticides, rather, these materials were evaluated by ARS, the various State University Experiment Stations, and the State and Federal Extension Services. In addition, AFPCB depended upon CSRS and its University-based research and extension system to prepare and publish manuals on pesticide use, plans for certification of pesticide applicators, and the disposal of old pesticides and pesticide containers. The final statements on safety and environment precautions on the use of herbicides commercially available to the military were

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determined by the agencies of the Public Health Service, and when necessary by the United States Army Environmental Hygiene Agency.

To ensure that military installations were identifying and controlling pests detrimental to military personnel, property, projects, and programs, the AFPCB had a cadre of military and civilian personnel via supporting Agencies and Laboratories (e.g., the Epidemiology Division of the School of Aerospace, Brooks AFB, Texas; USAF Occupational and Environmental Health Laboratory, Kelly AFB, Texas; and the Public Health Service) that routinely conducted Pest Surveys, Staff Visits, Training Programs, and Conferences on identifying and controlling pests. Reports of these visits, programs, and conferences were published by the Board and widely circulated to other military installations.

Summary

Under the Directives 5154.12 and 4150.7, the Department of Defense gave the Armed Forces Pest Control Board/Armed Forces Pest Management Board the authority to set pest management policy *"applicable for all Department of Defense pest management activities in any unit, at any time, in any place, even when conducted by contract operations."* The significance of this Directive is that any herbicides used after 1961 on DoD's more than 600 installations must have been approved by the Board, and must have met USDA's regulatory requirements, and all the requirements of FIFRA. The exception to these Directives was the development of the "Tactical Herbicides" sprayed in combat military operations in Vietnam, or by Department of State approval as used in Korea adjacent to the Demilitarized Zone in 1968.

Implications

Herbicides used in Operation RANCH HAND for defoliation and crop destruction projects, and by the US Army Chemical Corps for vegetation control on perimeters, cache sites, and similar militarily-important targets were classified as "Tactical Herbicides" and were formulated, tested, evaluated, and assigned "Military Specifications" by the Department of Defense. They were not subject to regulatory oversight by the Department of Agriculture, the Armed Force Pest Control Board, or the Federal Committee on Pest Control. However, the insecticides used in Operation Flyswatter were subject to the AFPCB, as were all other pesticides used for control of pests within the boundaries of the military installations in Vietnam.

There were no documents that indicated the herbicides used in Guam, or CONUS military installations were "tactical herbicides", rather, the available documents confirmed that all pesticides use in these locations and other US Department of Defense installations world wide were those commercially available and approved by AFPCB.

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Tactical Herbicides Deployed in Vietnam/Southeast Asia

DESCRIPTION

Herbicide Purple, 1962 – 1965: Purple was first formulated by the Army Chemical Corps at Fort Detrick, Frederick, Maryland in the mid-1950s time period. It was first used in the Camp Drum, New York defoliation tests in 1959 (*see Leaflet Site 8*). The formulation was a brown liquid soluble in diesel fuel and organic solvents but insoluble in water. One gallon of Purple contained 8.6 pounds active ingredient (acid equivalents) of 2,4-D and 2,4,5-T. The percentages of the Purple formulation were:

n-butyl 2,4-D	50%
n-butyl 2,4,5-T	30%
iso-butyl 2,4,5-T	20%

Herbicide Green, 1962: Green was a single component formulation consisting of the n-butyl ester of 2,4,5-T. It was used in limited quantities in 1962. The formulation was a light brown liquid soluble in diesel fuel but insoluble in water. One gallon of Green contained 8.16 pounds active ingredient of 2,4,5-T.

Herbicide Pink, 1962 –1964: Pink was a formulation of 2,4,5-T used extensively in the early RANCH HAND operations and in the defoliation test program in Thailand in 1964 (*see Leaflet Site 13*). One gallon of Pink contained 8.16 pound active ingredient 2,4,5-T. The percentages of the Pink formulation were:

n-butyl 2,4,5-T	60%
iso-butyl 2,4,5-T	40%

Herbicide Orange, 1965 – 1970: Orange was a reddish-brown to tan colored liquid soluble in diesel fuel and organic solvents but insoluble in water. The first shipment of Herbicide Orange arrived in Vietnam in March 1965. One gallon of Orange contained 8.62 pounds of the active ingredient 2,4-D (4.21 pounds) and 2,4,5-T (4.41 pounds). The percentages of the Orange formulation were:

n-butyl 2,4-D	50%
n-butyl 2,4,5-T	50%

Herbicide Orange II, 1967-1968: The same as Orange but with the substitution of the isooctyl ester of 2,4,5-T for the n-butyl ester of 2,4,5-T.

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Herbicide Blue (Liquid), 1966 – 1971: In 1961, the first Blue (95 drums) that was shipped to Vietnam was a powdered formulation that required water. In February 1966, the first Liquid Blue arrived in Vietnam. Herbicide Blue was a clear yellowish-tan liquid that was soluble in water, but insoluble in diesel fuel. One gallon of Blue contained 3.1 pounds of the active ingredient cacodylic acid. Blue contained both the cacodylic acid as the free acid and the sodium salt of cacodylic acid. The percentages of the formulation were:

cacodylic acid	4.7%
sodium cacodylate	26.4%
surfactant	3.4%
sodium chloride	5.5%
water	59.5%
antifoam agent	0.5%

Herbicide White, 1966 – 1970: White was a dark brown viscous liquid that was soluble in water but insoluble in diesel fuel or organic solvents. Herbicide White first arrived in Vietnam in January 1966. One gallon of White contained 0.54 pounds of the active ingredient 4-amino-3,5,6-trichloropicolinic acid (picloram) and 2.00 pounds of the active ingredient of 2,4-D. White was formulated to contain a 1:4 mixture of the triisopropanol-amine salts of picloram and 2,4-D. The percentages of the formulation were:

triisopropanolamine salt of picloram	10.2%
triisopropanolamine salt of 2,4-D	39.6%
inert ingredient (primarily the solvent, triisopropanolamine)	50.2%

The studies reported in the Leaflets describe how the tactical herbicides and the spray equipment were developed, tested, evaluated for use in Vietnam. The outcome of this process was that the tactical herbicides were sprayed at the rate of 3 gallons per acre in Vietnam. These were formulations and concentrations that greatly exceeded how the commercial components of these tactical herbicides (2,4-D; 2,4,5-T; picloram; and, cacodylic acid) were formulated and used in the United States in brush and weed control, and in forestry management.

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Search Strategy for Historical Documents on Tactical Herbicides

SOURCES

The Department of Army research on tactical herbicides was conducted primarily by the Army Chemical Corps' Plant Sciences Laboratory, Fort Detrick, Frederick, Maryland and it predecessors. A search was conducted of more than a thousand documents of the Army Chemical Corps at the National Archives in Greenbelt, Maryland.

The United States Armed Services Center for Unit Records Research (CURR), The Department of Army, Springfield, Virginia was contacted with the assistance of the Deployment Health Support Directorate, Deputy Under Secretary of Defense (Installations and Environment), Department of Defense, Washington, DC. CURR provided numerous leads on important documents.

The Defense Technical Information Center (DTCI), Fort Belvoir, Virginia, is the "premier provider of DoD technical information." DTIC is the repository of the documents submitted by the military to its predecessor, the Defense Documentation Center (DDC). A DTIC search resulted in the identification and acquisition of numerous DDC documents.

The Armed Forces Pest Management Board's Defense Pest Management Information Analysis Center, and Literature Retrieval System, Forest Glen Section, Walter Reed Army Medical Center, Washington, DC. The Literature Retrieval System is an online collection of scientific papers comprising more than 102,000 documents in searchable PDF format for research purposes only. The Literature Retrieval System was an excellent source of information.

The Alvin L. Young Collection on Agent Orange, Specially Collections, The National Agricultural Library, Beltsville, Maryland, This is a collection of more than 7,000 documents collected by Dr. Alvin L. Young from 1969 – 1987 on the issues associated with the use of herbicides in Vietnam and Southeast Asia. Many of the documents are technical reports of research conducted by the military on the use and disposal of tactical herbicides. Included are technical reports by Dr. Young on the fate of the tactical herbicides in the environment. Approximately 1,600 documents are retrieval in a searchable PDF format.

The Office of Air Force History, Bolling Air Force Base, Washington DC, and the Office of History, Air Force Logistics Command, Wright-Patterson Air Force Base Ohio were additional sources for information on tactical herbicides, Operation RANCH HAND Operations Operation PACER IVY and Operation PACER HO.

DOD TACTICAL HERBICIDE SITES

Site 1

Location: Bushnell Army Air Field, Florida

Dates⟶ February – April 1945

Activity Description: The purpose of this research was to determine means of accomplishing defoliation of tropical vegetation by application of a chemical agent. The herbicidal agents evaluated included the acids of 2,4-D and 2,4,5-T as 2% formulations in tributyl phosphate and diesel fuel. A total area of 382 acres (155 ha) was aerially sprayed, some areas receiving multiple applications.

Assessment: During the three-month period, a team (five military officers) from Camp Detrick, Frederick, Maryland, conducted preliminary screening of tropical plants obtained from the Plant Introduction Garden, Coconut Grove, Florida. Following the initial evaluations, aerial spray tests were conducted on "grids" of the natural vegetation adjacent to the runways on the Bushnell Army Air Field. Observations were made over the three-month period. The herbicides were formulated at Camp Detrick and transported to Bushnell Army Air Field.

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DOD TACTICAL HERBICIDE SITES

Site 2

Location: USDA Station, Brawley, California

Dates⟶ July—August 1951

Activity Description: By the early 1950's, the herbicides 2,4-D and 2,4,5-T were being extensively evaluated by the United States Department of Agriculture (USDA) for their weed control properties. However, much of this work provided evidence that these same herbicides were detrimental to broadleaf crops, i.e., beans, soybeans, peppers, tomatoes, etc. Hence, the US Army Chemical Corps' Biological Laboratories at Camp Detrick, Frederick, Maryland, initiated studies to determine application rates that could be used in tactical operations as anti-crop agents. Formulations of 2,4,D and 2,4,5-T were evaluated on small field plots of various agronomic crops in an effort to evaluate the anti-crop effectiveness of small droplet sprays of these herbicides.

Assessment: The Army Chemical Corps established a project agreement with Division of Weed Investigations, Bureau of Plant Industry, Soils and Agricultural Engineering, USDA, to conduct studies on the toxicity to agronomic crops of various 2,4-D and 2,4,5-T formulations. The rates varied from 0.5 pounds (lbs) of active ingredient of the herbicide per acre (A) to 8 lbs/A. USDA personnel at the USDA Research Station at Brawley, California conducted all of the studies. Camp Detrick personnel provided project oversight and the formulations to be tested.

Source: b6 [redacted] (1952): Field Plot Experiments with Plant Inhibitors, the 1950–51 Crop Season. Special Report No. 156, Chemical Corps, Biological Laboratories, Camp Detrick, Frederick, Maryland, August 25, 1952. *The Document declassified 17 April 1962 but subject to export control.*

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DOD TACTICAL HERBICIDE SITES

Site 3

Location: Eglin Air Force Base, Florida (Test Ranges 52 and 57)

Dates→ November – December 1952, March – April 1953

Activity Description: In preparation for the potential use of tactical herbicides for use as anti-crop agents, the Air Force Air Research and Development Command, Wright-Patterson Air Force Base, Ohio, tasked the Air Force Armament Center, Eglin Air Force Base, Florida, with the requirements for the design and procurement of a Large Capacity Spray System to used in the B-29, B-50, and C-119 bomber aircraft.

Assessment: In late 1952, a mixture of technical butyl 2,4-D (50%) and technical butyl 2,4,5-T (30%) and technical isobutyl 2,4,5-T (20%) was aerially sprayed from altitudes of 100-1000 feet at an airspeed of 200 mph. Tank size varied between 125-640 gallons. Spray systems were tested for B-29, B-50, and C-119 aircraft. The total spray area was 8,700 acres. This is first documented use of the Purple formulation. In the 1953 tests, the ester formulation was aerially sprayed from a B-29 and a C-119 aircraft from altitudes of 1,000-2,000 feet. Tank size was 1,000 gallons in both aircraft. 8,500 gallons of herbicide were released at a rate of 0.34 lbs/A on 8,000 acres of both test areas. A small number of Air Force, Army, and contractor personnel were involved in the operations. The formulation was furnished by the US Army Chemical Corps, Camp Detrich, Frederick, Maryland.

Source: b6 [redacted] and b6 [redacted] 1953): Anticrop Aerial Spray Trials, Phase III. Special Report No. 184, US Army Chemical Corps' Biological Laboratories, Camp Detrick, Frederick, Maryland, February 15, 1953. *The document declassified 4 November 1954 but subject to export control. Available from the Defense Documentation Center, Accession Number AD49572*

b6 [redacted]gust 1953): Evaluation of Production Model of Large Capacity Spray System for B-29 and C-119 Aircraft. Technical Report No. 53-33, Air Force Armament Center, Eglin AFB, Florida. *The document declassified 4 November 1954 but subject to export control. Available from the Defense Documentation Center, Accession Number AD17563*

1876

DOD TACTICAL HERBICIDE SITES

Site 4

Location: USDA Experimental Fields, Gallatin Valley, Bozeman, Montana

Dates⟶ July – August 1953

Activity Description: In 1951, the US Army Chemical Corps evaluated the phytotoxicity of 2,4-D and 2,4,5-T on broadleaf crops. The question remained as to whether the phenoxy herbicides were equally phytotoxic to narrow leaf grain crops. Thus, a preliminary series of field evaluations were conduced of various 2,4-D and 2,4,5-T formulations as anti-crop agents against wheat. The tests were conducted at the United States Department of Agriculture (USDA) Research Center in the Gallatin Valley near Bozeman, Montana.

Assessment: The objective of these experiments conducted on wheat was to determine the feasibility of applying very small amounts of candidate anti-crop agents from a spray boom mounted on a light aircraft. The tests took place in July 1953 on 139 acres of hard red spring wheat. Four chemical agents were formulated by the Crop Division's Biological Laboratories, Camp Detrick, Maryland, and consisted of various mixtures of n-butyl, isobutyl and amyl formulations of 2,4-D and 2,4,5-T. The mixture of concentrated butyl 2,4-D and 2,4,5-T [50% butyl 2,4-D, 25% butyl 2,4,5-T, and 25% isobutyl 2,4,5-T – Herbicide Purple] was applied at rates from 0.03 to 4.18 lbs/A in four replications of plots within the 139 acres of wheat. The mixtures were sprayed from an altitude of 30 feet. Total quantity for all formulations of 2,4-D and 2,4,5-T was less than 55 gallons. Personnel involved were from either the USDA or from Camp Detrick.

b6 b6

Source: [redacted] and [redacted] (February 1954): Field Development of Chemical Anticrop Agents. Special Report No. 200, Crops Division, US Army Chemical Corps' Biological Laboratories, Camp Detrick, Maryland. *The document declassified 4 November 1954 but subject to export control. Available from the Defense Documentation Center, Accession Number AD49571.*

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DOD TACTICAL HERBICIDE SITES

Site 5

Location: Area B, Fort Detrick, Frederick, Maryland

Dates → June – July 1953

Activity Description: Experiments were conducted on field grown crops to determine the feasibility of using an experimental spray tower mounted on a pickup truck to simulate aerial spray applications of chemical anti-crop agents. In addition, since anti-crop agents were to be deployed from a bomber aircraft, it was essential to obtain crop yield data when sprays were applied under simulated tactical operational conditions.

Assessment: The tests were conducted on Area B, Camp Detrick, Maryland, The Purple mixture of technical butyls of 2,4-D/2,4,5-T was applied to 1-acre plots of soybeans and sweet potatoes at a rate of 0.05 lbs/A. The chemical mixture was sprayed from a 20-foot tower mounted on a pickup truck. The agent was applied in the evening under inversion conditions, and with a wind velocity between 2 and 3 mph and a direction parallel to the crop rows. Chemical Corps personnel were responsible for both the spray operations and the preparation and handling of the tactical herbicide.

b6 b6

Source: [redacted] and [redacted] January 15, 1954): Field Development of Chemical Anticrop Agents, Series 2, Response of Field Grown Crops to Chemical Anticrop Agents Released from an Experimental Spray Tower. Special Report No. 201, Chemical Corps, Biological Laboratories, Camp Detrick, Frederick, Maryland. *Document declassified 4 November 1954 but subject to export control. Available from the Defense Documentation Center, Accession Number AD49420.*

1878

DOD TACTICAL HERBICIDE SITES

Site 6

Location: Fort Ritchie, Cascade, Maryland

Dates→ April 1956 – September 1957

Activity Description: In 1956 and 1957, 577 chemicals were screened for the best available tactical defoliants, desiccants, and vegetation control agents. Selection of suitable agents was determined by evaluating environmental conditions, spray techniques, and formulations that increased the effectiveness of the defoliants and desiccants.

Assessment: Selected coniferous and deciduous trees native to the Fort Ritchie Reservation, Cascade, Maryland, were selected for treatment with 5, 60, 500, and 1,000 parts-per-million (ppm) applications of various 2,4-D and 2,4,5-T formulations. All applications were done by hand application. Sprays with the technical butyl esters of 2,4-D and 2,4,5-T were found to be most effective as defoliants. The applications of the tactical herbicides and the preparation of the formulations were the responsible of the personnel from the Biological Warfare Laboratories, Fort Detrick, Maryland.

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Source: [redacted] July 1959): Defoliation and Desiccation. Biological Warfare Laboratory Technical Report Number 16, Crops Division, Director of Biological Research, Army Chemical Corps Research and Development Command, US Army Biological Warfare Laboratories, Fort Detrick, Frederick, Maryland. *The document declassified July 1971 but subject to export control. Available from the Defense Documentation Center, Accession Number AD31980.*

1879

DOD TACTICAL HERBICIDE SITES

Site 7

Location: Dugway, Utah

Dates→ May 1951 – March 1959

Activity Description: Ten projects of chemical anti-crop agents were conducted on the Dugway Proving Ground, including tests with formulations of 2,4-D and 2,4,5-T, between 7 May 1951 and 23 March 1959.

Assessment: The series of tests were all conducted from a variety of platforms, including balloons, an experimental spray tower, light aircraft, and jet aircraft, and with a range of volumes from low volume to large capacity spray tank volumes. Studies were conducted on the effects of altitude and airspeed on the droplet behavior of chemical anti-crop agents. The formulations, including the butyl ester formulations of 2,4-D and 2,4,5-T, were prepared by the US Army Chemical Corps, Fort Detrick, Frederick, Maryland. Personnel were from the Chemical Corps or on detail from the United States Air Force.

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Sources: [redacted]961): Summary and Evaluation of Chemical Spray Trials, Technical Report 61-1B, Volume 2, Bibliography, C-E-I-R, Inc., Dugway Field Operations, Dugway, Utah, 31 August 1961. *Document declassified 19 October 1964.* (Summaries included for Special Report 149, 7 May 1951; Special Report 151, 20 December 1951; Special Report 184, 15 February 1953; Special Report 201, 15 January 1954; Special Report 200, February 1954; Special Report 225, November 1954; Special Report 227, 14 January 1955; Special Report 232, June 1955; Summary Report E-47-2, 2 December 1957; Summary Report E-47-3, 23 March 1959). *All documents subject to export control. Summary document available from the Defense Documentation Center, Accession Number AD354205.*

1880

DOD TACTICAL HERBICIDE SITES

Site 8

Location: Fort Drum, New York

Dates → May – October 1959

Activity Description: The basic consideration in aerial applications of liquid sprays for vegetation control is to secure maximum deposition of the delivered agent on the selected target. In the summer of 1959, a 2,4-D/2,4,5-T formulation was evaluated for its operational use in defoliating or killing trees growing in an area of about four square miles in an impact zone (an area receiving explosive ordnance) at Camp Drum, New York.

Assessment: Thirteen drums (715 gallons) of the concentrated butyl esters of 2,4,D and 2,4,5-T (Herbicide Purple formulation) were aerially applied by helicopter over 2,560 acres of Fort Drum's deciduous forested area in the summer of 1959. The area selected for treatment was an area isolated from combat maneuvers. The tests were conducted by US Army Chemical Corps personnel, and the Purple Herbicide formulation was surplus herbicide from an inventory manufactured in 1953-1954 period for potential use in the Korean Conflict. The rates of deposition and the flow rate calculations were instrumental in subsequent defoliation tests in both the Continental United States and in Southeast Asia.

Sources: b6 [redacted]62): Section VI. Vegetation Control, Camp Drum, New York. IN: Vegetational Spray Tests in South Vietnam. US Army Biological Laboratories, Fort Detrick, Frederick, Maryland. *The document unclassified but subject to export control. Available from the Defense Documentation Center, Accession Number AD0476961.*

b6 [redacted](1964): Crops Division Defoliation Program. IN Proceedings of the First Defoliation Conference, 29-30 July 1963. United States Army Biological Laboratories, Fort Detrick, Frederick, Maryland. *The document is unclassified but subject to export control. Available from the Defense Documentation Center, Accession Number AD0427874.*

1881

DOD TACTICAL HERBICIDE SITES

Site 9

Location: Eglin AFB, Florida, Test Area C-52A and Hardstand 7

Dates→ March 1962 – January 1971

Activity Description: The training of the aircrews, the development of the interface between the aircraft and the spray equipment, and the test and evaluation of the entire aerial spray system were the responsibilities of United States Air Force's Air Development Test Center (ADTC), at Eglin Air Force Base (AFB). For ten years (1961-1971), the Air Force Armament Laboratory at Eglin AFB provided the scientific, engineering, and technical support for Operation RANCH HAND in Vietnam. One of the most important aspects in the development of aerial spray systems was testing of the equipment under the most realistic conditions possible. An array of test grids was developed where the aircraft and equipment could be monitored and evaluated using the actual herbicides that were deployed for use in Vietnam. The goal was not to test the effectiveness of the herbicides, but rather the effectiveness of the aircraft and spray equipment in disseminating a concentration of herbicide that would be effective in defoliating jungle vegetation.

Assessment: During the 10-year period, four test grids, each uniquely arrayed to match the needs of either fixed-wing, helicopter, or high performance jet aircraft, were established and operated within the boundary of Test Area C-52A. During the years of its operation, an area of less than 1 square mile of the Test Area received 15,455 gallons of Herbicide Purple (281 drums) and 18,975 gallons of Herbicide Orange (345 drums), 4,400 gallons of Herbicide Blue (80 drums). Spray equipment tests and evaluations of the more than 400 missions over the Test Area were generally scheduled and conducted with environmental conditions optimal for spray operations. The total estimated flight time spent dispensing herbicides over the four test arrays was 235 hours.

The program terminated in the spring of 1971, and Test Area C-52A was set-a-side as a unique research site for the environmental impacts of tactical herbicides and the associated dioxin. In 1978, following the conclusion of many ecological and environmental studies, the entire area was fenced and restricted from public access. The decision by the ADTC to allow natural attenuation to clean the ecosystem of chemical residues prevented a major reclamation operation of an area of more 400 acres.

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In support of the test and evaluation programs on Test Area C-52A, ADTC established a herbicide storage and aircraft loading site at Hardstand 7, an asphalt and concrete aircraft parking area located west of the North-South Runway on the main Eglin AFB Airdrome. Hardstand 7 was the herbicide-loading site for the approximately 400 aerial missions in support of the aircraft and spray equipment tested on the Test Area. In 1974, 130 drums of Herbicide Orange were removed from the Hardstand to the Naval Construction Battalion Center, Gulfport, MS for final disposition

In the first years of the tests programs on Test Area C-52A, numerous US Army Chemical Corps personnel were involved in the operations. By 1963, Air Force Armament Laboratory military, civilian, and contractor personnel were involved in the handling and test operations. Hundreds of military and civilian personnel were involved in the Eglin AFB Test Programs, and subsequent ecological studies over the years from 1963 to 1983.

Sources: More than 25 technical reports on test operations and ecological studies involving Test Area C-52A and Hardstand 7 are available in the Special Collection on Agent Orange at the National Agricultural Library, Beltsville, MD.

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Young AL, [redacted] 1975): Studies of the Ecological Impact of Repetitive Aerial Applications of Herbicides on the Ecosystem of Test Area C-52 A, Eglin AFB, Florida. *Available from the Defense Documentation Center, Accession Number AD-A032773.*

Two recent articles have been published that summarize the test programs and ecological studies on Test Area C-52A and Hardstand:

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Young AL, [redacted] 004): Long Overlooked Historical Information on Agent Orange and TCDD Following Massive Applications of 2,4,5-T-Containing Herbicides, Eglin Air Force Base, Florida. *Environ Sci & Pollut Res* 11(4): 209-221.

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[redacted] (2004): Environmental Persistence of 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin in Soil Around Hardstand 7 at Eglin Air Force Base, Florida. *J Soils and Sediments* 4(3): 151-156.

1883

DOD TACTICAL HERBICIDE SITES

Site 10

Location: Fort Ritchie, Fort Meade, Maryland

Date → 1963 – 1964

Activity Description: The search for effective defoliants prior to Vietnam focused primarily on the effectiveness of the phenoxy herbicides 2,4-D and 2,4,5-T. Thus Herbicide Purple was the earliest formulation that was considered appropriate for use in Vietnam. However, the Crops Division of the US Army Biological Laboratories continued its search for other potential defoliants that could be used in Vietnam. This effort was both an in-house program at Fort Detrick, and a contractual program managed by Fort Detrick. By the early 1960s, the knowledge and experience in synthesizing and evaluating various chemicals with herbicidal properties was located primarily with the Chemical Companies that were developing new pesticides for agricultural use. Thus, in 1963, the Army Chemical Corps sponsored the first of three "Defoliation Conferences". The First Defoliation Conference was held at Fort Detrick on 29-30 July 1963. At this Conference, the major pesticide producers in the United States were invited to participate. The concept was that the companies through contractual agreements would synthesize new potential compounds and that Fort Detrick would screen these compounds for the necessarily biological activity.

The screening program by Fort Detrick was carried out in three phases: primary screening on 14 day-old Black Valentine beans at 0.1 and 1.0 pounds per acre (lbs/A); secondary screening of the most promising chemicals sprayed in the greenhouse at 1, 5, and 10 lbs/A on maple, spruce, pine, locust, privet, pin oak, hemlock, and elm seedlings; and, the third phase consisted of field screening. Some initial field screening occurred at Fort Detrick. Subsequent field screening was conducted at Fort Ritchie and Fort Meade in Maryland, geographically not far from Fort Detrick, but on Military Reservations sufficiently large to permit spraying individual trees or small plots in areas isolated and restricted from public access. The field screening was used to answer the question: "At what rate are certain compounds effective, if not effective at 5 or 10 lbs/A?"

Assessment: The 1963 tests at Fort Ritchee consisted of spraying various rates of picloram, 2,4-D, Herbicide Orange, diquat, endothal, and combinations of each of these on 108 individual trees consisting of ash, elm, and locust. The 1963 field tests at Fort Meade consisted of spraying 24 plots, each 225 square feet, with cacodylic acid, Dowco 173, and butynediol at 10, 25, 40, 55, 70, 85, and 100 lbs/A on 15 species of trees, including scrub pine, maples, oaks, American chestnut, sweet gum, tulip poplar, quaking

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aspen, and vaccinium. The 1963 tests confirmed the selectivity and effectiveness of a combination of picloram-2, 4-D (subsequently later labeled Herbicide White), and a water-soluble sodium formulation of cacodylic acid (subsequently later labeled Herbicide Blue). The 1964 field trials continued the evaluation of various "new" compounds that were sprayed on 105 plots, each 225 square feet, with 52 different compounds and formulations at 5 and 10 lbs/A.

Because the trees and plots at Fort Ritchie and Fort Meade were spread over a considerable area, and the terrain was frequently very rough, the spray system consisted of 3-gallon tank sprayer with a 20-foot hose and a 9-foot stainless steel wand having a 20-inch boom with three No.2 Whirljet nozzles. The compounds and formulations were carefully weighed to the desired rates in the laboratory at Fort Detrick, and then poured into the tank sprayer with just enough diluent to cover a plot or an individual tree. The sprayers were outfitted with pressure gauges so that each tree could be sprayed at 30 lbs pressure. Spraying was done from a large tank truck so that the spray was directed down on the foliage to more closely simulate aerial spraying. All personnel involved in the handling and spraying of the chemicals were military and civilians assigned at Fort Detrick.

Sources: [redacted] (1964): Proceedings of the First Defoliation Conference, 29-30 July 1963. United States Army Chemical Corps' Biological Laboratories, Fort Detrick, Frederick, Maryland. *Document is unclassified but subject to export control. Available from the Defense Documentation Center, Accession Number AD0427874.*

[redacted] (1965): Proceedings of the Second Defoliation Conference, 5-6 August 1964. United States Army Chemical Corps' Biological Laboratories, Fort Detrick, Frederick, Maryland. *Document is unclassified but subject to export control. Available from the Defense Documentation Center, Accession Number AD0329567.*

[redacted] 966): Proceedings of the Third Defoliation Conference, 10-11 August 1965. United States Army Chemical Corps' Biological Laboratories, Fort Detrick, Maryland. *Document is unclassified but subject to export control. Available from the Defense Documentation Center, Accession Number AD898001.*

DOD TACTICAL HERBICIDE SITES

Site 11

Location: Dugway Proving Ground, Dugway, Utah

Date ⟶ September – October 1964

Activity Description: The objectives of the tests conducted on the Dugway Proving Ground during September and October 1965 were to determine the performance reliability, maintenance requirements, and suitability of the Army Interim Defoliant System for the US Army OV-1 (MOHAWK) aircraft.

Assessment: Six dissemination trials of the E44 Interim Defoliant System were conducted using two E44 spray tanks mounted under the wings of a US Army OV-1 (MOHAWK) aircraft. For each trial, Herbicide Orange was released at the deposition rate of 3 gallons/acre over an area of approximately 17 acres. In six trials, 935 gallons (17 drums) of Orange were disseminated on the test area. The trials were conducted by the US Army Chemical Corps' Biological Laboratories, Fort Detrick, Maryland, under an agreement with the US Army Test and Evaluation Command. The US Army Chemical Corps and the Dugway Proving Grounds provided all the personnel and tactical herbicides for the tests and evaluations.

Sources: US Army Test and Evaluation Command (1965): Integrated Engineering/Service Test of an Interim Defoliant System. Part I. Service Test, USATECOM Project No 5-4-3001-02. US Army Aviation Test Board, Fort Rucker, Alabama. *Document is unclassified but subject to export control. Available from the Defense Documentation Center, Accession Number AD466566.*

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[redacted] (1965): Final Report of Integrated Engineering/Service Test of an Interim Defoliant System. US Army Test and Evaluation Command, Dugway Proving Ground, Dugway, Utah. *Document is unclassified but subject to export control. Available from the Defense Documentation Center, Accession Number AD363013.*

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DOD TACTICAL HERBICIDE SITES

Site 12

Location: Georgia Power Company Right-of-Way, and Tennessee Valley Authority Power Line Right-of-Way

Date → May 1964 – October 1965

Activity Description: The successful screening of candidate defoliants at Fort Ritchie and Fort Meade prompted Fort Detrick personnel to seek additional sites where a more extensive evaluation could be conducted on Herbicide Orange, Picloram-2,4-D (Herbicide White formulation), and with various combinations of the commercial herbicides diquat and dicamba. The objective of the field tests was to evaluate these formulations under field conditions against the standard tactical herbicide "Purple".

The Crops Division arranged with Georgia Power Company and Tennessee Valley Authority for the use of 65 acres of right-of-way through the swamps of Georgia, and additional 65 acres of right-of-way in the mountains of Tennessee. The test sites selected in Georgia were characterized by swamp forest vegetation with a long, hot, growing season and ample water available for active growth. Typically, the level of water in the swamp was between 6 and 24 inches. Sections of the right-of-ways for the Valdosta-Thomasville Power Line and the Bonaire Power Line near Macon were selected for treatment. In Tennessee, a section of the 200-foot right-of-way provided by the Tennessee Valley Authority was in a mountainous area and on a power line between Hiwassee Dam, North Carolina, and Coker Creek, Tennessee.

Assessment: The aerial spray tests conducted on these transmission line right-of-ways were by helicopter. In Georgia, six plots, each 60 by 2,640 feet, were treated on the Valdosta-Thomasville line, which had a 60-foot right-of-way. On the Bonaire line, with 200-foot wide right-of-way, seven plots were established each 200 feet wide and 700 feet long. At both locations, Herbicides Orange and Purple were applied at 10 lbs/A. The proposed Herbicide White formulation was applied at 4 lbs/A picloram and 11 lbs/A 2,4-D. In the aerial tests in Tennessee, the plots were difficult to mark because of the mountainous terrain, and thus the right-of-way (approximately 3 acres between adjacent powerline towers), served as the tests plots. The Orange and Purple Herbicides were applied at 4, 8, and 33 lbs/A. The proposed White formulation was sprayed at rates of 6.25, 11.50, 19.10, and 25.5 lbs/A. The plots in Georgia were sprayed on 20-23 May 1964. The plots in Tennessee were sprayed 17 June and 2-3 July 1964.

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The Bell G-3 helicopter used in all tests was equipped with two 60-gallon saddle tanks and a 24-foot boom rigged amidship. Twenty-four D-8 nozzles without swirl plates were placed on 1-foot centers along the boom. The helicopter sprayed a 50-foot swath at an altitude of approximately 60 feet above the ground. All applications were made either just after sunrise or just before sunset when wind velocities were between 0 and 3 mph. Observations on all the plots in both Georgia and Tennessee were made over a period of one year. The Companies provided the helicopter and operators. The herbicide formulations and on-site personnel were provided by Fort Detrick.

Sources: b6 [redacted] (1965): Proceedings of the Second Defoliation Conference, 5-6 August 1964. United States Army Chemical Corps' Biological Laboratories, Fort Detrick, Frederick, Maryland. *The document is unclassified but subject to export control. Available from the Defense Documentation Center, Accession Number AD0329567.*

b6 [redacted] (1966): Proceedings of the Third Defoliation Conference, 10-11 August 1965. United States Army Chemical Corps' Biological Laboratories, Fort Detrick, Maryland. *The document is unclassified but subject to export control. Available from the Defense Documentation Center, Accession Number AD898001.*

DOD TACTICAL HERBICIDE SITES

Site 13

Location: Pranburi Military Reservation, Thailand

Date ⟶ April 1964 – April 1965

Activity Description: The objectives of the Thailand tests were to (1) determine minimal rates and volumes of Herbicide Purple, component 2,4,5-T butyl and isobutyl esters (Herbicide Pink), Dinoxol (31.6% butoxyethanol ester of 2,4-D and 30.3% butoxyethanol ester of 2,4,5-T), and Herbicide Blue applied at different seasons of the year for effective defoliation; and, (2) evaluate the effectiveness of other selected defoliants, desiccants, and herbicides applied singly or in combination mixtures at different seasons of the year on representative vegetation of Southeast Asia.

Assessment: The test site locations were established on the Pranburi Military Reservation. Arrangements were made with Thai governmental authorities to use the facilities of the Ministry of Communications Airport at Hua Hin (25 miles from the test site) as a base of operations for the twin engine Beechcraft (C-45) used for test applications. Survey and preparations of two test sites were initiated in August 1963. Lanes were cleared to mark boundaries of a series of 10-acre test plots for a total of 1450 and 2000 acres of treatment at the two test sites, respectively. The trials began on 2 April 1964 and continued through 8 September 1964 with duplicate 10-acre plots treated with each chemical mixture using three 100-foot swaths per plot flown at a height of 30 to 50 feet above treetops. Evaluations of vegetative responses to chemical treatments were made at periodic intervals, and primarily by photographic techniques. Observations continued for one year after treatment.

During the period from April through September 1964, approximately 115 gallons of Herbicide Purple, 46 gallons of Herbicide Pink, 21 gallons of Dinoxol and 15 gallons of Herbicide Blue were aerially sprayed on 170 acres of Pranburi Military Reservation, Thailand. Five civilians and 5 military personnel from Fort Detrick, Maryland, conducted the spray operations and subsequent research. Approximately 25 Thai civilian workers were involved in the preparation of the test sites, and 4 US civilian workers were involved in evaluating the results of the spraying through the end of September 1964. The names of the US personnel are listed in the source document.

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Source: b6 [redacted] 1965) OCONUS Defoliation Test Program, Semiannual Report, 1 April – 30 September 1964. ARPA Order No. 423, US Army Biological Laboratories, Fort Detrick, Maryland. *Document declassified October 1977, but subject to export control. Available from the Defense Documentation Center, Ascension Number AD360646.*

1890

DOD TACTICAL HERBICIDE SITES

Site 14

Location: Aberdeen Proving Ground, Maryland

Date → May 1965 – May 1966

Activity Description: Scientists at Fort Detrick were concerned about the equipment they were using to simulate aerial applications to forest vegetation. The studies at Aberdeen Proving Ground, Maryland, were designed to evaluate a new spraying apparatus. A truck was outfitted with a "cherry-picker basket" having two booms, each 20 feet long. The upper and lower booms were able to rotate 110 and 90 degrees, respectively; both booms would then rotate horizontally 410 degrees. Controls for operating the booms were in both the basket and truck. The actual spray equipment consisted of a one gallon pressurized container connected to an air supply, and a 5-foot spray boom with three No.5 Whirl-jet nozzles. The lift was positioned over the area to be sprayed and by rotating the lift the spray system closely simulated helicopter applications.

Assessment: The research at the Aberdeen Proving Ground was conducted in two different areas on the Proving Ground, but both locations were isolated from public access. The predominant species at both locations were sweetgum, black willow, persimmon, black gum, white oak, pin oak, and sumac. In the first location, 314 plots (each 225 square feet) were sprayed with 70 compounds applied alone or in combination between May and September 1965. At the second location, 75 plots were used to test the seasonal variations of five different formulations of proposed tactical herbicides, including Herbicides Orange and Purple, picloram, and cacodylic acid. They were sprayed at proposed tactical operational rates in May, June, July, August, and September 1965. All formulations were prepared and sprayed by civilian and military personnel affiliated with the Fort Detrick's Biological Laboratories, Frederick, Maryland.

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Source: [redacted] (1966): Proceedings of the Third Defoliation Conference, 10-11 August 1965. United States Army Chemical Corps' Biological Laboratories, Fort Detrick, Maryland. *The document is unclassified but subject to export control. Available from the Defense Documentation Center, Accession Number AD898001.*

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DOD TACTICAL HERBICIDE SITES

Site 15

Location: Middleport, New York

Date ⟶ May – September 1965, July 1966

Activity Description: Under a January 1965 contract with the US Army Biological Laboratories, Fort Detrick, Maryland, FMC Corporation conducted studies in an attempt to improve the herbicidal properties of the Herbicide Purple and Herbicide Orange formulations. Field plots of "several acres" were identified near the Niagara Chemical Division, FMC Corporation Facilities in Middleport, New York.

Assessment: Various esters (n-butyl, iso-butyl, iso-octyl) formulations of 2,4-D and 2,4,5-T were mixed in "suspensions " with auxiliary herbicides (e.g., dalapon,diuron, atrazine, ammonium thiocyanate, aminotriazole, and cacoylic acid) and evaluated for stability and phytotoxicity. Individual plots, dominated by deciduous brush, were seven feet square and a specified volumes equal to rates of 1 to 3 gallons per acre were administered by use of a spray gun. Five replications of each rate was tested, and observations taken throughout the seasons in 1965 and 1966. The two tactical herbicides Purple and Orange were provided by the Army Biological Laboratories, Fort Detrick, while the auxiliary herbicides were obtained from commercial sources. The researchers involved in the mixing of formulations and in the various tests were employees of the FMC Corporation.

Source: b6 [redacted]967): Herbicidal Formulations of Enhanced Efficacy for Defoliation: Final Report. Prepared for the US Army Biological Laboratories, Fort Detrick, Frederick, Maryland, by the Niagara Chemical Division, FMC Corporation, Middleport, New York.

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DOD TACTICAL HERBICIDE SITES

Site 16

Location: Preston, Maryland

Date ⟶ October 1967

Activity Description: Under a contract with the Air Force Armament Laboratory, Eglin Air Force Base, Florida, the Tidewater AG Systems Company was tasked with developing new spray nozzles for the UC-123B Internal Modular Spray System. The purpose of the visit to the Tidewater AG Systems Facilities in Preston, Maryland, was to evaluate the new spray nozzle for potential use on the A/A 45Y-1 Spray System used in Operation RANCH HAND.

Assessment: A crop dusting aircraft was outfitted with the AG nozzles and flown at an altitude of approximately 20 feet above ground level, and at an estimated 95 mph air speed. The Orange Herbicide was mixed with kerosene and was sprayed over a line of kromekote cards spaced at two-foot intervals for two hundred feet. The droplet size was estimated to be 100 microns. The evaluation was observed on-site by the military and civilian representatives to the Defoliant/Anticrop Subcommittee of the JTCG Technical Coordinating Group. Three employees of the Tidewater AG Systems Company participated in the test and evaluation.

Source: b c [redacted] (9 October 1967): Trip Report, Preston, Maryland and Fort Detrick, Maryland. Biological Branch, Bio-Chemical Division, Air Force Armament Laboratory, Eglin AFB, Florida.

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DOD TACTICAL HERBICIDE SITES

Site 17

Location: Base Gagetown, New Brunswick, Canada

Date ⟶ June 14-17, 1966 and June 21-24, 1967

Activity Description: The successful screening of tactical herbicides in Arkansas, Georgia, Tennessee, Florida, and Maryland prompted the Fort Detrick personnel to seek a site outside the Continental United States to evaluate a selection of tactical and commercial herbicides on a mixed hardwood-conifer forest. Following discussions with Canadian Military Forces, a decision was made to evaluate an array of herbicides on vegetation of the Canadian Forces Base Gagetown, New Brunswick, Canada. Base Gagetown contained 427 square miles, of which 80% was heavily forested. The site for the 1966 trials was located in the western portion of Base Gagetown between Broad Road and Blissville Road. The test site was an undisturbed forest consisting of a mixture of conifers (fir, spruce, and pine) and broadleaf deciduous species (maple, alder, and beach) ranging in height from about 20 to 75 feet. It was approximately 4 miles long by 1,200 feet wide. Because of terrain and surrounding swamp, only tracked vehicles were able to navigate through the mud and mire to the test site. The base of operation was the Blissville Air Strip, located approximately 4 miles from the test site.

The test area for the 1967 field trials was located approximately 10 miles from the nearest border of the military reservation. Specifically, the test site was located on Rippon Road and east of Broad Road, and consisted of a densely wooded area dominated by broadleaf deciduous species and fir, spruce, and pines. Fifty plots, each 200 by 660 feet (3 acres) with a 200-foot buffer zone between adjacent plots, were laid out on both sides of Rippon Road. As in 1966, the base of operation was the Blissville Air Strip, located approximately 4 miles from the test site.

Assessment For 1966 Field Trials: A total of 116 plots, each 200 by 600-feet with a 100-foot buffer strip between plots, were marked off along both sides of an east-west oriented trail through the forested area. The corners of each plot were delineated by strips of colored surveyor's tape, and were marked with a 6-inch-square aluminum plate identifying the plot. A US Army helicopter equipped with a HIDAL spraying system consisting of a 200-gallon fiberglass tank, an electrically driven centrifugal pump, and two booms, each approximately 25 feet long. The booms were fitted with 15 check values on 6-inch spacing with each value fitted with a Teejet nozzle tip. The helicopter was flown at treetop level at 65 knots airspeed during the three days of spray operation. Plots were flagged for the pilot with telescopic fiberglass poles that

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extended to a height of 50 feet with fluorescent orange flags attached. The compounds were applied at rates of 1, 2, 3, or 4 gallons per acre on duplicate plots. Because the HIDAL system was calibrated to deliver 1 gallon per acre, the pilot had to fly over the same area two to four times to deliver the higher rates. Spraying began on 14 June 1966 when new leaves were fully expanded and the trees actively growing. Spraying was done during a stationary low pressure atmospheric condition when there was little or no wind so that spraying was continuous from daylight to dark for 3 successive days, thereby completing 107 plots in about 30 hours actual flying time. The remaining nine plots were left as check plots.

Of the nine compounds tested, four contained 2,4,5-T. They were described as Orange (50:50 mixture of n-butyl esters of 2,4-D and 2,4,5-T), Purple (50% n-butyl ester 2,4-D, 30% n-butyl ester of 2,4,5-T, and 20% isobutyl ester of 2,4,5-T), 70:30 Mixture (70-30 mixture of n-butyl esters of 2,4-D and 2,4,5-T), and M-2993 (1:4 mixture of isooctyl ester of picloram + propylene glycol butyl ether ester of 2,4,5-T).

Of the 107 plots receiving herbicides, 46 plots received 2,4,5-T at varying rates. Thus for the entire experiment, 55 gallons (1 drum) of Orange were sprayed on 14 plots (38.5 acres), 55 gallons of Purple (1 drum) were sprayed on 14 plots (38.5 acres), 50 gallons of 70:30 Mixture were sprayed on 12 plots (33 acres), and 12 gallons of M-2993 on 6 plots (16.5 acres). The 46 plots received a total of 172 gallons of 2,4,5-T containing herbicide, or approximately 800 pounds of 2,4,5-T as the butyl ester or butyl ether ester sprayed on 126.5 acres which equates to approximately 6 pounds of 2,4,5-T per acre aerially applied at tree-top level.

The authors acknowledged the two men who piloted the helicopter, and a Canadian Major who assisted the two researchers in the field as a Range Officer. They also acknowledged the "enlisted men" of the Royal Canadian Army Service, the Royal Canadian Horse Artillery, and the Air Observation Post. Presumably the enlisted men may have been involved in the logistical operations of receiving and transport of the herbicide to the airfield and in assisting the loading of the aircraft. The isolation of the site and how the operation was conducted suggested that few men outside of the Fort Detrick Research Team would have been involved in the actual spraying of the herbicides.

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1966 Sources: [redacted]nd [redacted]968): Defoliation Tests in 1966 at Base Gagetown, New Brunswick, Canada. Technical Memorandum 141, Department of the Army, Fort Detrick, Frederick, Maryland. *Document unclassified but subject to special export control. Available from the Defense Documentation Center, Accession Number AD 843989.*

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[redacted]966): Trip Report – Evaluation of Defoliation Tests at Canadian Forces Base Gagetown, New Brunswick, Canada. Crops Division, Fort Detrick, Frederick, Maryland.

Assessment for the 1967 Field Trials: The plots were sprayed by a Bell G-2 helicopter fitted with two 40-gallon saddle tanks and a 24-foot boom with nozzle

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spacing every 6 inches along the boom. The system was calibrated to deliver 3 gallons per acre at an altitude of 10 to 15 feet above the tops of the trees while flying at 40 knots indicated air speed. The resultant spray swath was 50 feet. Fifteen herbicides were applied by helicopter on duplicate 3-acre plots at a volume of 3 gallons per acre. The original plan was to spray duplicate plots at 3, 6, and 10 gallons per acre, but due to unfavorable weather conditions only treatments at 3 gallons per acre were applied. Of the 15 herbicides used in this experiment, only 2 contained 2,4,5-T herbicide; Orange and a material labeled as HCA + T (hexachloroacteone + 2,4,5-T, formulated to contain 2 pounds HCA and 2 pounds 2,4,5-T per gallon). One of the other materials sprayed on duplicate plots was pentachlorophenol, although not containing 2,4,5-T it was likely contaminated with dioxin and furan congeners.

Orange was sprayed on a total of 6 acres at a rate of 3 gallons per acre for a total quantity of 18 gallons of herbicide, or approximately 90 pounds of 2,4,5-T, or 15 pounds of n-butyl 2,4,5-T/acre. HCA + T was also sprayed on 6 acres for a total of 24 pounds of 2,4,5-T or 4 pounds of 2,4,5-T/acre. The pentachlorophenol was applied at 12 pounds/acre. All of the other herbicides were commercial products, but not containing 2,4,5-T. The flagging to identify individual plots by the helicopter pilots was done by the use of telescopic fiberglass poles that extended to a height of 50 feet with fluorescent orange flags attached. These were fixed and not held by ground crew.

Because the treatment plots were located on both sides of Rippon Road, access to the plots was easier than in the 1966 studies. The authors acknowledged the cooperation of Base Gagetown Commanding Officer, the Range Officer, and the assistance of enlisted personnel.

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1967 Sources: [redacted] and [redacted] 1968): Chemical Defoliation of Northern Tree Species. Technical Memorandum 145, Department of the Army, Fort Detrick, Frederick, Maryland. *Document unclassified but subject to special export control. Available from the Defense Documentation Center, Accession Number AD 842825.*

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[redacted] (1971): Field Evaluation of Desiccants and Herbicide Mixtures as Rapid Defoliants. Technical Report 114, Plant Sciences Laboratories, Fort Detrick, Frederick, Maryland. *Document unclassified but subject to special export control. Available from the Defense Documentation Center, Accession Number AD 880685.*

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DOD TACTICAL HERBICIDE SITES

Sites 18

Location: Kauai, Hawaii

Date → 1 May 1967 – 30 June 1968

Activity Description: During the period December 1966 to October 1967, the newly named "Plant Science Laboratories" at Fort Detrick initiated a comprehensive short-term project to evaluate desiccants and herbicidal mixtures as rapid-acting defoliants. The objectives of these studies were to evaluate rapid-acting desiccants as defoliants and to assess the defoliation response of woody vegetation to mixtures of herbicides and/or desiccants. The criteria for assessment was based principally on rapidity of action, but included other features such as safety and ease of handling, compatibility with dissemination systems, and low toxicity to man and wildlife. The Kauai Branch Station of the Hawaii Agricultural Experiment Station was selected as the site to evaluate tactical and commercial herbicides on tropical woody and forest vegetation.

This research was conducted by the Department of Agronomy and Soils of the University of Hawaii with oversight provided by the Plant Sciences Laboratory, Fort Detrick, Maryland. The primary purpose of the research was to evaluate a series of tactical herbicide formulations on tropical vegetation. It was conducted on the Island of Kauai at the Kauai Branch Station of the Hawaii Agricultural Experiment Station, at Kapaa, Hawaii. Four experimental sites (series) were selected for the evaluation of the herbicides. Three of the sites were in tropical vegetation within five miles of the experiment station and were located on the Wailua Game Refuge, Bauxite Reclamation Project, or the Department of Land and Natural Resources, respectively. The fourth site was located at Moalepe in the Wailua Game Refuge.

Assessment: As noted, the main objective of this research was to evaluate the rapidity of action and the degree and duration of defoliation and damage on trees and shrubs of Hawaii to aerial applications of selected chemicals and chemical mixtures. The investigations were divided into four categories or series of tests. The experimental plots ranged from 2-acre plots for Series I and II, to 5-acre plots in Series III, and 6-acre plots in Series IV. The 2,4,5-T related materials included Silvex, M-3140 formulation (picloram + 2,4,5-T), Orange Herbicide, Hexachloroacetone + 2,4,5-T, and M-3190 (picloram + 2,4,5-T + dalapon). Both Blue (Phytar 560G) and White (Tordon 101) were also evaluated in the series of tests.

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Approximately 111 acres of replicated plots out of 232 acres were treated with 2,4,5-T (51 gallons), Silvex (35.5 gallons), or Orange Herbicide (92.5 gallons) during the period from 24 July through 21 December 1967 (or approximately 1.7 gallons of active ingredient 2,4,5-T per acre). Blue was applied at 2, 4, or 6 gallons per acre (180 gallons), while White (tactical formulation M2628) was applied at 3 and 6 gallons per acre (54 gallons). All applications were done by a fixed-wing commercial applicator (Murryair, Ltd.) capable of applying a 40-foot swath and delivering either 3 or 6 gallons of formulation per acre. The vegetation in the various plots ranged in height from 3-6 feet for Lantana (*Lantana camara*) to more than 60 feet for Silveroak (*Grevillea robusta*). Although the plots were accessible by ground vehicles, they were in areas isolated from public access. The investigators reported that some drift did occur from the plots, especially those sprayed in the late fall. However, the drift was in the opposite direction of any private or commercial agricultural fields. All locations received heavy rainfalls within the first and second months following applications. Observations and vegetative-injury ratings of the plots were obtained 1, 2, 3, and 4 weeks following application, and on a monthly basis thereafter.

In all tests, precautions were taken in handing of chemicals. Each person was required to wear gloves, goggles, respirators, and aprons or coveralls. Aircraft props were cut-off during loading to ensure safety from chemical backwash and carelessness. The report did not state whether the flagman were required to wear the same safety gear. All excess herbicide in the aircraft tank and spray system was collected, transferred to steel 55-gallon drums, and buried. Empty containers were also buried immediately following completion of the spraying. The locations were not specified. The aircraft tank and spray system was rinsed once with diesel fuel (which was also collected and buried) and followed with a thorough washing. The exterior of the aircraft was also washed. All of the herbicidal chemicals were provided by the Department of the Army, Fort Detrick, Maryland. Three investigators from the University of Hawaii, one investigator from USDA, the pilot, and Experiment Station support personnel were involved in the tests and subsequent evaluations.

Sources: b6 [redacted]: Defoliation of Tropical Jungle Vegetation in Hawaii. Final Report, May 1, 1967 to June 30, 1968, Department of Agronomy and Soil Science, University of Hawaii, Honolulu, Hawaii, and the Department of the Army, Fort Detrick, Frederick, Maryland. *Document is unclassified but subject to export control. Available from the Defense Documentation Center, Accession Number AD 839968.*

b6 [redacted] (1971): Field Evaluation of Desiccants and Herbicide Mixtures as Rapid Defoliants. Technical Report 114, Plant Sciences Laboratories, Fort Detrick, Frederick, Maryland. *Document unclassified but subject to special export control. Available from the Defense Documentation Center, Accession Number AD 880685.*

DOD TACTICAL HERBICIDE SITES

Site 19

Location: Five Locations in Texas, including Llano, Refugio, Victoria, Carlos, and Livingston

Date → March 1963 – June 1967

Activity Description: Because of its large area and extreme variations in environmental conditions, Texas has a rich flora. Many of these species are represented, either by genus or species, in Southeast Asia, and other tropical areas. The forest components of Texas, as in other temperate regions, may be broadly classed as conifers or softwoods, and broadleaf or hardwoods. The brush vegetation on rangeland in Texas was considered analogous to thorn thicket of tropical regions. Several genera, and even species that occurred in Texas, were also found in Southeast Asia. These included mesquite, huisache, and other species of *Acacia*, retama, and Macartney rose. It was concluded by Department of Army personnel at Fort Detrick, Frederick, Maryland that research on tactical and commercial herbicides in Texas would contribute to the understanding and use of such herbicides in Southeast Asia.

The research in Texas on the use of tactical and commercial herbicides was sponsored the Advanced Research Projects Agency (ARPA), Department of Defense. Reports of the research were reported at all three of the Defoliation Conferences (1963, 1964, and 1965). Personnel of the Agricultural Research Service, United States Department of Agriculture, were responsible for the conduct of the research. The objectives of the research were to "discover and evaluate new herbicides and principles for killing trees, brush, and other vegetation; develop methods for evaluating herbicides on different species of woody vegetation; develop methods and principles for improved application techniques; and, determine effects of environment on behavior and effectiveness of promising herbicides."

The treatments in Texas were made at five locations on a variety of woody species. The species were selected because previous work had shown them to relatively resistant to phenoxy herbicides. In addition, they represented many plant families and genera so that a broad array of taxonomic entities was involved. Research sites in Texas were located at Llano (on the Edwards Plateau), Refugio (on the Gulf prairie), Victoria (in a post oak savannah), Carlos (in piney woods), and Livingston (in piney woods). The sites were lands leased from private landowners, and varied from approximately 45 to 60 acres.

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Assessment: The treatments at all five locations in 1963 through 1964 were initially applied with a contourmatic boom sprayer mounted on a ¾-ton truck. The boom had three sections, each of which could be positioned hydraulically from controls on the truck. The research sites where the contourmatic boom sprayer was used were selected on the basis of brush and density and growth low enough to permit treatment. Truck mobility on the research sites was aided by bulldozing lanes through the brush. Plots were then established on each side of the lanes. A plot width of 22 feet was used for all treatments because that width could be effectively treated with the two end sections of the boom. Most of the plots were 95 feet long, but some were as much as 200 feet long. Beginning in May 1964 through 1966, plots in most locations were also established for aerial applications. For these aerial applications a fixed-wing aircraft was used. Generally, the plots were either 5-acre plots 160 feet wide and 1,320 feet long, permitting four 40-foot swaths for each plot, or 4-acre plots 200 feet wide and 840 feet long permitting five swaths on each plot. Two replications in a randomized block design were treated with the fixed-wing aircraft flying about 10 feet above the vegetation.

Multiple plots were sprayed at all locations over a period of four years, 1963 –1966. For example at Llano, Texas:

Test No. 1, Llano: Fourteen herbicides at various rates were applied to whitebrush on July 30, 1963. A volume of 10 gallons per acre was applied on two plots for each treatment. Herbicides included Orange @ 4, 8, and 12 lbs/A; 2,4,5-T ester @4, 8, and 12 lbs/A; and, 2,4,5-T: dicamba (1:1) @ 8 lbs/A.

Test No. 2, Llano: Whitebrush was treated with 11 herbicides on October 1, 1963. Various herbicidal rates were evaluated but volume was constant at 5 gallon/A. Two plots were sprayed for each treatment (plot size: 22 x 95 or 22 x 200 feet). Herbicides included 2,4,5-T @1, 4, 8 lbs/A; and 2,4,5-T:diquat (1:1) @8 lbs/A.

Test No. 3, Llano: Replicated plots of whitebrush were treated with 12 herbicides on May 11, 1964. A volume of 10 gal/A was used and included Orange @ 4 and 8 lbs/A; 2,4,5-T @ 1, 4, 8 lb/A; and, 2,4,5-T: paraquat (1:1) @ 8 lbs/A.

Test No.4, Llano: Nine herbicides were applied on replicated plots of whitebrush on October 7, 1964. A volume of 10 gal/A was used and included Orange @ 4 lbs/A; MCPA: 2,4,5-T (1:1) @ 1 lbs/A; and, MCPA: 2,4,5-T (2:1) @ 1.5 lbs/A.

Test No. 5, Llano: Fourteen herbicides were applied to replicated plots of whitebrush on May 11, 1965. A volume of 10 gal/A was used and included Orange @ 8 lbs/A; MCPA: 2,4,5-T (2:1) @1.5 lbs/A; MCPA: 2,4,5-T (4:1)@ 2.5 lbs/A; 2,4,5-T @ 0.5 lbs/A; 2,4,5-T: ammonium thiocyanate (1:1) @1 lbs/A; and, picloram: 2,4,5-T (4:1) @ 2.5 lb/A.

Test No. 6, Llano: Five herbicides were applied at various rates to whitebrush on October 11, 1965. Two plots per treatment at a constant rate of 10 gal/A containing various formulations of picloram from 0.5 to 4 lbs/A.

Test No. 7, Llano: The last foliage treatment to whitebrush was on May 20, 1966, and compared Orange to paraquat, picloram and M-2993 (1:4 mixture of isooctyl ester of picloram + propylene glycol butyl ether ester of 2,4,5-T). Treatments were applied at 6 gallons/acre. Orange was evaluated at 12, 24, and 48 lbs/A while M-2993 was evaluated at 7.5, 15, and 30 lbs/A.

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